The Builder.

VOL. XL. No. 1967. SATURDAY, MARCH 5, 1881.

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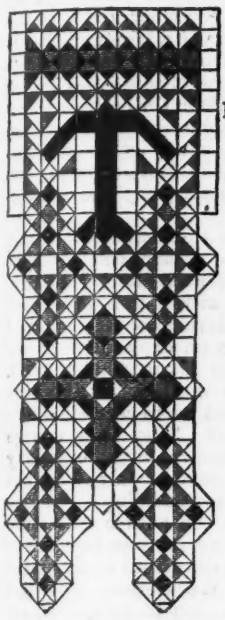


Bramante and St. Peter's.

THE above heading indicates what is the main subject of a very laborious and valuable work recently brought out by M. Geymüller.* The part taken by Bramante in the great work is the central object of the author's interest, and a considerable portion of the text is occupied by comments on the life and genius of Bramante, apart from his connexion with St. Peter's. M. Geymüller is persuaded that Bramante was a much greater architect than he has generally been supposed to be, and that his ideas in regard to St. Peter's were much finer, architecturally, in themselves, and had much more direct influence on the ultimate plan of the building, than has been hitherto believed. In Haydon's autobiography it is, if we remember, that a conversation is recorded between the painter and Lord Melbourne while the latter was sitting for his portrait, in the course of which Lord Melbourne asked if Bramante had not been a nephew of the reigning Pope when he was appointed architect to the cathedral, and on Haydon answering in the affirmative, the Premier replied, "Ah! then, you may depend upon it, it was a job." Some such idea as this seems to have clung round the memory of Bramante; at least, he has been thought of as a man who made an abortive design, which was patched up, so far as it had been commenced, by Sangallo, and then entirely superseded and lost under the work of Michelangelo. It is a main object of the author to show that the part played by Bramante was a more important one than this. But the interest of the large volume of plates, fifty-four in number, accompanying the text, is much wider than this.

We have here brought together for our inspection some of the most interesting and significant of the many sketches and relics in existence in reference to the inception and progress of the great church, and a very remarkable and interesting collection it makes. We are here brought behind the scenes; we see the Renaissance architects at their work; we have the *facsimiles* of the various trials and experiments in the treatment of this and that part of the building, and we realise to some extent what an absorbing piece of work it was for the age in which it was planned, and what an amount of thought was bestowed in the effort to realise a building which should satisfy the aims and ambition of its architects, and of the equally ambitious hierarchy which set them to work. The point we seem especially to realise in turning over some of these plates is the slow and piecemeal manner in which the great basilica grew into being. In modern times we are accustomed to see a large building drawn out complete beforehand, and set to work upon with a fixed intention as to its ultimate shape, and a business-like provision for the means of carrying it out, which renders it possible to know within a few months in how long a time it can be completed. But there was none of this ordered and continuous progress in the erection of St. Peter's. It is a long chapter of experiments, of leaps in the dark almost, of operations commenced on a great scale, but hardly carried on far enough to develop into anything definite when an interruption came either from the death of the architect or from shortness of funds, or from a feeling that mistakes had been made which rendered it necessary to reconsider the whole ordonnance of the building; and in the interim the masses of masonry which had been piled up were left to stand and to become overgrown with vegetation, so as to look, both in their scale and in their dilapidated appearance, more like part of the ruins of old Rome than like the commencement of the great central building of modern Rome. Some of the facsimiles of contemporary engravings and sketches given among M. Geymüller's plates bring out this in a most striking manner; views representing St. Peter's in progress, and showing us nothing but huge masses of masonry, and two or three arches standing up neglected from amid mounds of building rubbish, like the relics of some great temple of a former age. And the peculiarity in regard to St. Peter's is that up to a comparatively late period there does not seem even to have been any positive or fixed intention as to the treatment of the building *en masse*. It is a kind of story of "what will he do with it?" Various complete plans were made, and models, but long after the building was commenced there seems to have been no certainty as to whether it should be a Greek or a Latin cross, no fixed idea as to the shape or construction which the dome would ultimately take. In the matter of plan there was no doubt that the clergy, for reasons of ritual and conservative sentiment, wanted the Latin cross, as the Western form of church and as a reminiscence of the plan of the Constantine basilica which formerly occupied the site. A considerable proportion of the architects were on the side of the Greek cross plan, and rightly so, as far as architectural effect in relation to a great dome is concerned. That there was to be a grand dome or central cupola of some kind seems to have been the one point on which every one was agreed, and the only point necessary to decide before commencing. Let the central feature be brought well up first, and it would then be time to consider what kind of adjuncts to apply to it. And in more than one of the views the central piers and the four large arches and pendentives are nearly all that is to be seen, the piers standing like four great rocks with the arches flying from one to another, not even the haunches being built up; the whole standing as if abandoned, and giving, perhaps even more remarkably than the finished building, the idea of the vast scale on which the work was conceived.

Among the various schemes for the whole edifice, there can be no doubt, on the evidence afforded by two fac-similes of original sketches given by M. Geymüller, that Bramante was in favour of, and actually sketched out, a building on a Greek cross plan. The well-known plan in a Latin cross form, with a rather long nave in five bays, which is given in Mr. Fergusson's "Modern Architecture" as Bramante's plan for St. Peter's, is also given here, not only in an original sketch, but in a completely-drawn-out plan, as "the plan improperly termed Bramante's." Whether it can be proved that Bramante never made such a plan as that may be questionable,—it is difficult to prove negatives; but if we are to accept as genuine the sketches given as Bramante's, the author fully proves that Bramante at least produced other and much finer plans for St. Peter's than the one in question, which is a remarkably tame and formal affair, and in virtue of which Bramante has usually been regarded as an architect of very commonplace ideas.* There is no completely-drawn-out plan by him, but a large number of sketches, either of complete plans or portions of plans. With regard to these sketches being the *bonâ fide* work of Bramante, we must, to a certain extent, of course, accept for the present the word of M. Geymüller, who has worked long enough at the subject to be an expert at it. A large number of those assigned to Bramante are, however, at all events, obviously the work of the same hand, and if one of them can be proved the others follow. A large number of them are rough sketches, executed without any rule or other instrument, in the red crayon which was so

* Projets Primitives pour la Basilique de St. Pierre de Rome, par Bramante, Raphael-Sanzio, Fra Giocondo, les Sangallos, &c. Publiés, pour la première fois en fac-simile, avec des restitutions nombreuses et un texte. Par Le Bon Henry de Geymüller. Paris: J. Baudry. Vienna: Lehmann et Wentzel. 1880.

* It is worth remark that while Mr. Fergusson, in his admirable "History of Modern Architecture," attaches great importance to Bramante's ideas in regard to St. Peter's, and observes that though we do not fully understand what they were in detail, we may safely conclude that it would have been better if later architects had adhered to them, yet he credits Bramante only with what is really a very weak and commonplace plan. It appears, on M. Geymüller's showing, that he is to be credited with something much better than this, and that Mr. Fergusson's judgment in Bramante's favour was capable of being supported by much more satisfactory evidence than the historian of architecture affords his readers. The plan which he gives, from a work of the last century by Bonanni, appears, from M. Geymüller's showing, to be an incorrect reproduction by Serlio of an original plan attributed by M. Geymüller to Raffaelle. The original and Serlio's edition of it are given side by side on Plate 26. In point of fact, it would appear that Bramante's plan was to a great extent adhered to, and that what spoiled the building was not so much the plan as the way the architectural design was carried out in detail.

common a medium among the draughtsmen of the Renaissance in Italy. Others are in ink. We will just go through the portfolio of drawings, and notice what indications there are of Bramante's ideas.

The first we come to, called an early plan of Bramante's for St. Peter's, is a half-plan of a Greek cross building (plate 3), not effective, the piers occupying a great part of the vista and of the floor space, without being really very massive, as they are too much cut into by recesses, and the crossing-piers are not adequate to a very heavy dome. The arms of the cross in this plan are somewhat narrow and far extended, the exterior angles being filled up by large chapels. The author has drawn out the plan and given a restored section, which latter, however, does not seem to rest on much positive evidence. The original plan in this case is pretty fully drawn, and is tinted in block, in red. The next noticeable sketch is a very rough bit of plan, outlined only in red crayon, but which is very interesting.* It is a sketch of the treatment of the main piers under the dome, and shows, in addition to the solid pier with niches, &c., two columns detached in front of the pier, and so placed as at the same time to combine with the pier as part of it, and to range with two intermediate columns standing under the cardinal arches of the dome, thus forming nearly the effect of a colonnade round the central space. The author has drawn out a plan based upon this suggestion in the margin. The next plan we come to (plate 9), is very important and significant. This is a rough crayon sketch, on squared paper, showing the outline of the old basilica, with its well-known small transept at the extreme end, and giving a nearly completely-sketched plan of a Greek cross church over it, the crossing coming (as was probably desired by the clergy) over the site of the altar of the old basilica, and the new plan not reaching the western limit of the old church, but extending far beyond its eastern limits.† The important point in this plan is the form of the great piers of the crossing, which are similar in area and in form to the piers as they now exist, except for the large semicircular niches on two sides of them, which niches did exist in the present piers, and were built up by Sangallo in his desire further to strengthen the piers. It has, however, been generally assumed that Bramante's piers were so inadequate as to have been entirely built up and hidden by the later architects. There is here, however, proof (granting that the sketch is by Bramante) that the present general shape and area of the main piers was given by him, and never departed from in the main features of the design. M. Geymüller gives a plan (plate 45) of the present building, showing by various tints the portions of the plan attributable to Bramante, Raffaelle, Sangallo, Michelangelo, and Maderno, and he points out one very good reason for supposing that the piers in their main form are as Bramante built them, viz., that in one of them there were three different accesses to the staircase in the pier, two of which it was thought necessary subsequently to build up. Now, says M. Geymüller, it is not likely that at the time of Sangallo, whose main business was to strengthen the piers, an outer pier would have been built honeycombed with passages in this way; the more natural conclusion is that the passages were already there, and consequently the pier in which they were formed. The general plan in this sketch shows the northern, eastern, and southern arms of the cross with apsidal terminations, as in the present plan, so that we have here all the main features of Michelangelo's plan. In the earlier study mentioned above the terminations are apsidal internally, but semi-octagons externally. On the inner side of two of the piers next the dome, coupled columns are roughly sketched in as an afterthought. The author has been fortunate enough to come across a perspective sketch outline in black ink, which is evidently the perspective of this same plan, but without these two suggested columns. This sketch, which is given as an illustration to the text, is interesting in other ways, as showing the method employed of considering the design at once picturesquely and constructively; it consists of a view across the dome into one of the arms of the cross, showing the two further piers and the perspective beyond them, with the crossing arches and the base of the dome; but the two piers nearest the foreground are also shown to half their height, the upper part being removed so as to show the plan of the pier in perspective. In speaking of the design as a Greek cross, we mean that it is so in relative dimensions only, for the western arm is treated with a square end and with two bays between the end and the crossing arch, so that it produces the effect of a Latin cross, exactly as in Michelangelo's church before Maderno's addition, which in this portion of the plan also it considerably resembles. In fact, this might very well pass for a study for the plan of the present St. Peter's, taking out Maderno's portion.

The next plate, a red crayon sketch of precisely similar style, shows the eastern part of the plan to a somewhat larger scale; both drawings are scribbled over in the margin with small perspective sketches of the dome and its supports, as if to try the effect. A third sketch of the same portion in the same material follows. Then we have some very fine engraved plates showing the author's idea of Bramante's scheme as it would have been if completed. The plan gives a complete Greek cross with four equal apsidal arms. The crayon plans give no authority for treating the western arm in this way; it makes, no doubt, architecturally a more complete design, but as the east end of a Christian church is the culminating point, it would seem far more logical to treat the entrance façade in a different manner from the eastern end to which it forms only the access. It must be admitted, however, that ground is furnished for the probability that such a treatment was, at least, at one time contemplated, by the ancient engravings and coins given on plate 2, some of which show the intended building with an apse in the end facing the spectator, and still more by a small perspective sketch in pen given on plate 18. This, though rough and hasty in drawing, is, as M. Geymüller observes, of quite Hellenic balance and completeness in composition; and this shows a building with four apses, colonnaded round, and a low hemispherical dome with no lantern. The angle towers, which appear in all the old engravings and coins, are not carried up in this sketch, apparently with the intention of showing the whole composition of the main building better. A very rough outline elevation in red crayon, given in the text (facing page 24), is an exact repetition of this perspective sketch in general composition. Plate 18 also contains a rough crayon sketch of the complete Greek cross plan, placed in the centre of a great architectural court, partly connected with the Vatican buildings, the whole composition reminding one somewhat of the plan of the Baths of Caracalla. To return to M. Geymüller's restorations, we have an exterior elevation based on the old engravings and the various sketches, and making a fine composition on the whole. The towers, however, which are placed at the four angles (as in Sangallo's model), are stumpy in proportion, and not very beautiful, and it should seem that the author has been following too closely the coins and engravings, which are not to be depended upon for accuracy of proportion and detail. We could hardly believe that Bramante would have built towers at all like these. The dome in the restoration has a large, rather low, lantern, with a colonnade round it, a feature of which there are various sketches, and plate 1 gives us a large drawing of Bramante's idea of the dome and the lantern, "after Serlio," who it may be supposed had some special source of information. The general idea of this dome is evidently suggested by the Pantheon, but it has a colonnade round the drum. The lantern M. Geymüller has modified and improved a good deal, but, in both cases, we are led to question (as in the case also of Sangallo's design), whether the lantern is not dangerously heavy to be placed on the surface of a great hemispherical dome. We have then a very elaborate restoration of the section of Bramante's complete building, showing a great order of pilasters elevated on a stylobate, and carrying a cornice at the springing of the vault; the interspaces of the pilasters are divided into two heights by a sub-cornice, which crosses the large arch communicating between nave and aisles, and is there carried by a colonnade of two columns and responds on a much smaller scale than the pilaster order. These are most valuable in giving added scale to the whole, but there is not a hint of them in the red crayon plans before mentioned, and the author appears to have been misled by the marking of the columns of the old basilica on the same plan. In another section, which he gives as Bramante's final project, these subsidiary columns disappear, and the arrangement of the design follows the indications of the interior pen-and-ink perspective drawing which we before mentioned. This perspective in reality entirely corresponds with the red crayon plans, and the two seem to us to represent the same design. The stylobate is not shown in the perspective interior, nor are the bases of the pilasters, only the shafts, capitals, and cornice. There are, however, indications among other sketches in the portfolio which show that Bramante was fully alive to the graceful effect and the additional scale obtainable by introducing a lighter columnar order in the interspaces between piers of a larger order. It is remarkable, in comparing both these sections with that of St. Peter's as it now exists (which is given on the same scale in the portfolio), how coarse the existing design looks in comparison with them, showing painfully what a great opportunity Michelangelo lost through not having properly grasped the principles of architectural design.

On plate 20 are two or three studies for Latin cross plans, which the author designates as "drawn by Peruzzi under the direction of Bramante." Bramante is known to have suffered from gout in his hands during the latter part of his life, which furnishes an explanation of our finding ideas apparently his in another hand. There are plans drawn in black ink, by hand only, but with somewhat more care than Bramante's crayon sketches. They show a large use of columniation between piers, especially in one design, where a nave of three bays has a double row of four columns filling each space between the piers. As the author calls these "*études plus avancées*," we presume they are to be regarded as projects drawn out at a moment when the influence of the clerical idea had caused the Greek cross plan to be shelved for the time. Having unavoidably devoted some space to the consideration of the illustrations which mainly bear on the question of Bramante's part in originating the final idea of St. Peter's, we must confine ourselves to merely noticing very briefly a few of the most interesting of the other drawings and sketches presented to us in the portfolio. Plate 24 shows a most interesting view, but we do not know from what source taken, of the interior portion of the site, with the crossing arches of the new church as they long stood waiting further operations, intermingled with parts of the colonnade and other portions of the old basilica. Plates 28 and 29 give us a Latin-cross plan by Giuliano Sangallo, very similar to that usually known as Bramante's, except that on one side (for there are alternative arrangements) is a treatment with three side-aisles, with a forest of piers, each compartment domed; this would have been a fine plan for leading up to the great open space under the dome. There is a long Latin-cross plan by Antonio Sangallo, with piers occupying an immense proportion of the floor area, some fine free sketches for its internal treatment, and a restoration of the section by the author. Sangallo's plan as generally known, the Greek cross with the pronaos, appears only in one or two small and mostly roughly-sketched plans. Plate 43 gives *facsimiles* of eight small perspective studies for compositions of central domes grouped with surrounding cupolas, by that wonderful master of all trades, Leonardo da Vinci. Small as these are, they are among the most original and powerful things in the collection; each sketch is accompanied by a carefully-drawn plan, and the designs are thought out in the most truly architectural spirit. The last sheet of the series gives *facsimiles* of the handwritings of Bramante, Raffaelle, Peruzzi, Vasari, and the three Sangallos. Those of Vasari are imitation-printing, apparently headings to two of his "Lives"; Raffaelle's is a very beautiful hand; Bramante's signature, though in manuscript-hand, is as regular and clean as copperplate (the great artists of that time apparently did not affect the practice of too many people in the present day, of signing their names so that no one could read them); but we do not gather clearly whether the document No. 1, to which his signature is affixed, is also in his own writing; whosever it

* It may be interesting to notice that this, as well as several others of the original red crayon plans, are drawn on paper divided off into small squares, the use of which would seem to have been pretty general at that time.

† We use the words "western" and "eastern" in their usually understood meaning in regard to church planning.

is, it is about the finest piece of handwriting we ever saw,—a perfect combination of clearness with ease and flow of line,—a kind of hand fit for a race of artists.

For any consideration of the *pros* and *cons.* of M. Geymüller's conclusions in detail, and [the manner in which he has arrived at them, we must refer the reader to his very voluminous pages * (which, by the way, are printed in double columns of French and German, so as to be open to the greater part of European readers). To discuss critically a tithe of the matter introduced would be quite beyond the possibilities of our space; nor would it be to the purpose at present to enter into any discussion as to the authenticity of the plans and sketches attributed to Bramante. We do not profess to feel much doubt on this point. M. Geymüller, after some years devoted to the examination of original documents bearing on the subject, has a fair right, as we observed, to be considered an "expert"; and to form an independent opinion on the authenticity of the interesting drawings he has now put for the first time within reach of the general public, one would need to go through pretty nearly the same course of investigation of the contents of public and private libraries which he has himself gone through. Without committing ourselves to accept his conclusions, we are content to say that on the basis of the evidence he has furnished they seem extremely probable,—indeed, nearly indisputable. The chapter in which he sums up the general scope of his book draws our attention to the broad result of his conclusions, viz., that there may be said to have been two epochs in the history of St. Peter's; the first, in which the main idea of Bramante was gradually brought into shape; the second, in which, as the author expresses it, variations were played upon it by successive architects. The result of the whole appears to be that the finest points in the existing St. Peter's are mainly to be traced to his idea, surviving through subsequent variations.

A short chapter near the close of the book, on a parallel between St. Peter's and our St. Paul's, may be interesting to English architects, and contains some very good and significant criticism. The work is altogether one of the most valuable and interesting contributions to architectural literature that we have ever had before us, and the portfolio of plates is a treasure to all who are interested in studying the beginnings of a great historic building, and of observing how architects in the great period of the Renaissance carried on their studies and matured their ideas.

GOOD NEWS AS TO RAILWAYS.

THE London and North-Western Railway may be fairly regarded as a representative line. Its length of 1,676 miles forms nearly a tenth (actually 9·6 per cent.) of the aggregate railway mileage of the United Kingdom. Its cost of 49,934*l.* per mile (exclusive of mere nominal increase of capital) is nearly 25 per cent. above the average cost of 40,301*l.* per mile. Its gross annual receipts (9,389,000*l.* in 1879) amount to nearly 15 per cent. of the total gross earnings of our railways. Its proportion of expenditure (exclusive of interest of money) to receipts from all sources, is 53·25 per cent.; the average proportion for the railways of the United Kingdom being 52·79 per cent. And its net receipts show a return of 4·76 per cent. upon its nominal, and of 5·24 per cent. upon its actually paid-up capital; the ratio for the United Kingdom being 4·10 per cent. It has spent 7,500,000*l.* on its working stock. Out of the national stock of 12,969 locomotives, 39,066 passenger carriages, and 379,256 wagons, the London and North-western Railway owns 2,257 locomotives, 5,195 passenger carriages, and 44,481 wagons. Each locomotive engine earns a gross sum of 4,000*l.* per annum, and in the only year in which the comparison can be made, viz., 1875, each of the passenger locomotives earned 9,555*l.*, and each non-passenger locomotive 2,772*l.*

It is obvious that when a season of prosperity is acknowledged by the directors of this great line, the prospect is good for the English railway shareholder in general. In spite of many untoward circumstances, the movement of the London and North-Western Railway for the last half of 1880 has been prosperous. There has not, the chairman stated at the half-yearly meeting, been a single person killed on their system throughout the last year by the fault of the company or its servants (this, we apprehend, applies to passengers alone). The traffic earned a dividend of 4 per cent. for the half year, making up 7½ per cent. for the year, and carrying forward a larger balance than at any previous time. And even more worthy of note than the dividend is the fact that the increase of capital asked for the next half-year is only a little over half a million sterling, which so far shows a hopeful resistance to the canker of railway prosperity, the unchecked growth of capital.

So far, then, there is good reason to congratulate the shareholders. And especially are they to be congratulated on the fact that the directors have come to the conclusion that the mineral freights are so far controlled by the freights by sea and by canal, that it is imprudent to launch out into vast expense to provide coal wharfs to the south of the Thames, and to enter into arrangements with other companies for fighting for the carriage of sea-borne coal. If the good resolution thus declared be carried out, if the directors will have the courage to demand an independent audited debtor and creditor account of their mineral traffic, the gross earnings of which make up about a fifth of their gross revenue, we see no reason why, not so very long hence, a dividend of 10 per cent. should not replace a dividend of 7½ per cent.

There is yet another point on which, so far as we are in possession of the facts of the case, the London and North-Western Railway Directors deserve the gratitude, not only of the shareholders, but also of the entire public. The company have on their pay-sheets some 46,000 men, of whom nearly 14,000 are in the locomotive department. Out of this large number, only 1,149 had dissented from the proposal (which we believe the *Builder* was the first to advocate) to substitute an assurance made by common accord for the shadowy and vexatious rights to which the servants of the company may possibly be entitled under the Employers' Liability Act of last session. The locomotive men are divided into three classes. The sums of 100*l.*, 80*l.*, and 40*l.*, are respectively assured to all members of these classes in the event of accidents causing death or permanent disablement; and the sums of 10*l.*, 7*l.*, and 5*l.* in case of natural death. Further, there is an allowance secured of 21*s.*, 14*s.*, and 7*s.* per week in cases of partial disablement by accident, to be continued for fifty-two weeks if necessary. These terms are at once just and fair. There can be no doubt that they very far exceed anything that the men could expect to receive, as a body, under the Act. Equally liberal arrangements are made as to the other parts of the service. Two other provident societies receive the support of the directors, and a mutual provident society to provide for the men when past work, and the establishment of an orphanage for the children of the railway servants, are contemplated. The injurious effects of the Employers' Liability Act, which Mr. Moon "regarded as one of the most injurious that had ever passed the legislature," has been felt in deferring the completion of these provident arrangements. But there is every reason to hope that by the close of the present half-year the plans of the directors will be fully carried out, and their large staff, instead of being goaded into a state of constant warfare with their employers, will rightly claim the proud title of the best and best cared for service in the world.

ENLARGEMENT OF THE CHELSEA WORKHOUSE.

THE Chelsea Board of Guardians have decided to erect new workhouse buildings on a site which has been purchased for the purpose, the buildings to accommodate 300 inmates. The estimated cost is 15,000*l.* At the meeting of the Board, when the enlargement was resolved upon, Mr. Brass, one of the members, moved that plans for the new building be invited by public competition, observing that, as the outlay was likely to be so considerable, it was only fair that the best men should be entrusted with the superintendence of the work. There was a long discussion on the proposal, the guardians being considerably divided in opinion. Ultimately Mr. Brass's motion was rejected, and it was resolved that Messrs. Harston & Co., architects, be employed to prepare the necessary plans.

* We presume the work will be acquired for the library in Conduit-street, if it has not already been obtained.

ROYAL ACADEMY LECTURES ON ARCHITECTURE, 1881.*

BY PROFESSOR G. E. STREET, R.A.

The Development of Styles.

TO-NIGHT I propose to speak to you on the development of styles in architecture. It is a subject which every one is bound to study who wishes to know anything at all about the meaning and history, not only of the various orders or styles of architecture, but, one may almost say, of every detail of their ornament. In art, it is true, there are periods of progression and retrogression. We see a style gradually and patiently developed to perfection, and then, after a more or less prolonged reign, we see it deteriorate, either in the hand of the very nation by which it had been perfected, or, more commonly, by the influence of another nation, who, by right of conquest, have become masters, and have destroyed or modified the style which they found existing.

The modes in which styles are developed one out of the other are numerous. There is, first, the gradual progress towards perfection. There is the change caused by transplanting a style invented in one country to another, whose religious, political, and, more than all, whose climatic conditions are different. There is, again, the influence of new processes or new modes of construction, of new materials, or the absence of the materials by the use of which advance has hitherto been secured. There is the potent influence of religion; the influence, again, of individuals, either of great sovereigns or of skilful architects; and,—greatest of all,—that of military conquests, and the intercourse of traders with foreign countries. All these and many minor causes have contributed to the changes which have from time to time occurred in the history of our art, and to understand them all thoroughly some acquaintance is required with the history of various countries, with the growth and consolidation of states, and the connexion which has existed between them at various periods. But, even without this knowledge, it is possible to derive great gain from a merely general and summary study of the question, and it is in this that I wish to guide you to some extent to-night.

For our purpose it will be sufficient to go back so far only as the most perfect period of Greek art. With few and minor modifications, all existing European art may be traced back directly to Greece. The more ancient civilisations acted upon Greece, and, through Greece, upon Europe. Almost all Greek forms are derived from Assyria and Egypt; and, great as is the antiquity of Greek art, it is almost to be regarded as modern by the side of that of the East. We begin, therefore, with Grecian art after it had formed itself into a well-defined style, some six or seven centuries before the Christian era. At this date we find the Doric order in so well-defined and perfected a state in, *e.g.*, the Temple of Corinth, that for many centuries the variations from the type then established are only slight alterations from time to time in the proportions of the various parts, with a determined adherence to the general form and design as it was first seen. Some examples, as, for instance, the Lycian tomb in the British Museum, are, beyond all question, imitations of a wooden construction; but the question whether the design of the Doric order is or is not so also, has always been open to much discussion. The evidence of the entablature with the triglyphs above it is strongly in favour of a wooden origin; but, on the other hand, it is in the earliest examples that the columns are most clumsy and as unlike as possible to wooden posts. On the whole, however, this seems a not unlikely fault to have been committed in using a new material, whilst it is at least possible that the original wooden construction was confined to the roof resting upon stone or brick piers. And if the development of wooden construction into stone resulted in some of the grandest buildings for ages, showing the same adherence to the primitive type from first to last, it would be impossible to conceive a more singular survival of features, some of which had nothing whatever to do with the construction of the building. The Temple of Corinth, and probably the Temple at Assos in Asia Minor, date from the seventh century B.C. The Theatre at Girgenti was begun *circa* 480 B.C., the Temple of Theseus in 469, whilst the Parthenon was finished in 438. In a comparatively short period all the best examples of

* Third lecture, delivered on Monday, Feb. 21. (For previous lectures see pp. 202, 235, *ante*.)

Doric were erected, but for 200 years before the Parthenon was built, if not for more, architects had been building in the same way; whilst for centuries later the style was still persevered in, until we see one of its latest examples in the Forum at Pompeii,—probably a work executed under Greek influence,—within a few years of the birth of our Lord.

At the same time, we have the interesting fact that other styles co-existed with the Doric during the greater part of the period referred to. The Ionic Erechtheium on the Acropolis was built in about 420 B.C., and is, therefore, as nearly as possible of the same date as the Parthenon. The Corinthian is a later order, and generally under Roman influence, but even this co-existed with Doric and Ionic. We have here, therefore, the remarkable fact that in Greece at the same time three styles of architecture were deliberately practised, and that the only alterations were modifications of proportion. There was absolutely no development of a new style, no combination of the features of the three styles, and the Doric never, as time went on, underwent any modification or improvement from contact with the Ionic, or the Ionic from the Doric. Indeed, it is probable that architects confined themselves each to one style even if the adoption of the style did not depend,—as it did later, in the times of Guelph and Ghibelline in Italy, and of the Moors and Christians in Spain,—upon the politics or the blood and the race of those who built.

The Greek mode of construction was so dependent upon the use of single blocks of stone that it was all but impossible to attempt the erection of buildings of vast size. A remarkable evidence of this is afforded by the Temple of Jupiter at Girgenti. Here the dimensions are vastly in excess of anything ordinarily built by them, the height being absolutely more than twice that of the Parthenon, and the architect ventured on the device of building up his columns with small stones and attaching them to the wall in a way which shows how limited the application of the style of architecture was, and with a result which must have been as unpleasing as it was, happily, unusual. But even such an example as this has its interest, showing as it does that among the Greeks there was no such thing as impatience and fretfulness because new things were not perpetually being invented. A beautiful thing once done could not be too often repeated. Men never tired of seeing it.

The handmaid of Architecture,—Sculpture,—in the same way, was just as deliberate, and when a really beautiful work had been done there was no hesitation as to repeating it over and over again. The Venus of Praxiteles is said to have been repeated at least a hundred times; and the same thing may be said of many of the finest works of the greatest Greek sculptors.

The great virtue of the Greek artist was his appreciation of refinement of line, and his intense admiration for the noblest possible representations of man and beast. Compare Greek sculpture with Assyrian or Egyptian, and you see the gap which separates a perhaps dignified but always conventional figure from one in which the fire of the living soul is made to light up the well-wrought stone; and it was this temper which made him,—possessor as he was of almost unmatched skill,—content to labour on from one century to another in the reproduction of what he had once for all found to be very good.

From the Greek we turn naturally to the Roman, who was influenced by the magnificent remains of the Greek buildings in Southern Italy and in Sicily on the one hand, and by the even older work of the Etruscans on the other. He never realised the necessity of development in architecture, but the introduction of the arch, which he used freely in all his constructions, soon modified, and rapidly changed, the whole character of his art. He must be said, I fear, to have spoilt what he borrowed from the Greek, having little of his acute sense of beauty. He never observed that all Greek art was a reasonable adornment of a reasonable construction, and proceeded to treat the orders as mere ornaments to be added to the face of a wall, without any serious consideration of the purposes of the wall itself. He put the three orders one above another, three or four in height, pierced arches between them,—having discovered the value of the arch without discovering how it ought to be used,—and retained to each order and each stage of his building the heavy cornice, which had its *raison d'être* only in being the finish of a wall. In its larger works it is the brute force of the work, the vast thickness of the walls, the immense span of the arches and vaults, the trusting to size and solidity rather than to refinement or grace for the result to be achieved, that strike us, and not the beauty, imagination, or architectural fitness of the work. The architecture and the building were, to a great extent, wholly independent the one of the other. In some of the vastest Roman works,—as, *e.g.*, the Basilica of Constantine and the Baths of Caracalla,—the architecture has disappeared, and yet the walls remain. The architecture was *appliqué*, like a garment which had little to do with the body it covered, save to follow, in a general way, its outlines. The development (if it may be so called) which is seen in great orders piled one on another in the Flavian Amphitheatre, may well be compared with the Greek mode of treating a two-storied erection, as we see it in the *cella* of the Temple of Neptune at Pæstum, where the upper range of columns is simply a prolongation of those below, without entasis (for that would have been fatal to the continuity which was the essence of the design), and divided not by a cornice aping the top of a wall, but by blocks of stone forming a string-course and binding the whole together,—a construction strictly analogous to that of Gothic buildings, and wholly opposed to the Roman succession of orders.

I have said that the Roman used the arch without showing that he knew at all how it ought to be used. But it is in his capacity as artist, not as constructor, that I mean to make this statement. As a constructor he certainly had advanced far beyond the Greek, but his constructions are remarkable mainly for their vastness, and for the impression they convey of being the work of men who regarded the labour of hordes of untutored workmen with as much satisfaction as the work which could only be wrought by skilful hands. Or rather, I should perhaps say, they regarded the two things as entirely distinct,—built their walls, their arches, and their vaults first, and then brought their columns, their mouldings, and their statuary to adorn them. So that,—to take a good example,—the Villa of Hadrian, near Tivoli, is in its ruin a mass of rough brickwork, with hardly one single evidence of art in its design, whilst the museums of Rome have been richly endowed with statues and sculptures which existed in it without being architecturally part of it. The arch was used as a servant to do good work, and no more, for the Roman never perceived that if it were to be a feature in the building it must, almost of necessity, be the chief feature. His one development was to construct his arch in a wall which was divided into panels by imitations, more or less exact, of columns, with their enablatures and cornices. His endeavour was evidently to make it seem still as if the column and the entablature had something to do with the construction, though, in point of fact, they were absolutely independent of it, and were decorations of the face of the wall, regulated in their position, and in no other way, by the size of the arch required. Then the column, with all its belongings, being found to be an ornament and no more, it was natural to see it at last placed away from the wall, connected with it by a returned plinth and cornice, and, at last, carrying on its summit a statue or group which, by an after-thought, gave a kind of excuse,—and a very lame one it is,—for a piece of architectural feebleness which is almost unique. The development of the Roman upon what the Greek had given him was, therefore, nothing less than the destruction of the whole virtue of the original. That had been accurately constructed and well designed, whilst this was constructed with reference to design, and treated as no good architecture can possibly be,—as though the wall and its decoration were two wholly distinct and separable entities.

For the first three centuries of the Christian era I see no evidence of anything that can properly be called an architectural development, or that even seemed to pave the way for one,—with one notable exception. This is the fondness of the Roman builders for circular arrangements either of rooms or of alcoves in angles of rooms, and of alcoves placed *dos-à-dos*. Of all these, good specimens are seen in the Palace of the Cæsars on the Palatine Hill, and in the double temple of Venus and Rome hard by, where the two temples are identical in plan, each finishing in an apse placed back to back. In the Pantheon, the enormously thick wall is planned with recesses, some coved and some square on plan, and with detached columns carrying the entablature above them,—an arrangement which we shall see somewhat later, distinctly suggesting the design of the circular recesses under the dome of SS. Sergius and Bacchus at Constantinople, and San Vitale at Ravenna; whilst in the so-called Temple of Minerva Medica, a circular domed central space is surrounded by a series of ten recesses, nine of which are circular. The Greeks had shown their sense of the beauty of circular buildings, and the Romans followed in their steps, as we see in this example in the Pantheon at Rome, the Little Temple at Tivoli, and in the Temple of Vesta at Rome. But the necessity for enormous supports to their skilfully-constructed domical roofs led the Roman architects to make these recesses in the walls where they could safely be introduced, and thus to pave the way for the introduction of buttresses, and of the apsidal terminations and circular chapels around them, which played so large a part in much later developments.

It was in about A.D. 289 that the great step in advance was made in the building of Diocletian's Palace at Spalato, on the eastern shore of the Adriatic. Here a range of arches was carried,—probably for the first time,—on the capitals of columns, without the interposition of any sort of entablature. The same sort of construction had, it is true, been suggested long before in such erections as the portico of the Pantheon, where semicircular arches are turned over the lintels above the columns in order to take the whole weight to the capitals instead of on to the entablature. This apparently simple change was one which at once revolutionised all existing architectural laws. The column was no longer a mere ornament. It became at once the most useful, the most conspicuous, and in every way the most important, as it had always been the most beautiful, feature in a building. And from that time forward it was impossible ever again to construct a building as before with the post and lintel only, without deliberately ignoring the most useful and convenient discovery which has ever been made in the art of building. From that time the arch became master of the position, just as before the beam had been. The old system had lasted one can hardly say how many centuries, and it is needless to declare that nothing can ever make the use of the arch, round or pointed, obsolete in the same real sense as the use of the lintel or beam has become.

The Greeks, who, if they did not invent, at least perfected the orders, never in later times seem to have sympathised at all with the Roman modifications of them, most of which were consequent on the use of the arch. Their Byzantine art owes but little to Rome. It was, in truth, a genuine invention of a style developed out of Greek, but in which the arch was an essential feature, and in which the cornices and mouldings, the columns and their capitals, were all modified to suit it. Their decoration was almost entirely Eastern, both in its *motif* and in its mode of execution. Their development was a radical one; for in place of the old Roman and old Greek construction of plain walls and columns carrying only a dead weight, Byzantine art is remarkable for the extent to which it treated construction in a new fashion as an affair of weight and counterpoise. This was provided for in the arch and pier, in the dome and its supports. The Roman basilica required no great scientific skill for its erection, whilst the Byzantine buildings dealt with some of the most difficult problems of construction, and really foreshadowed the triumphs achieved in the scientific and delicate constructions of the Middle Ages. During this period, *i.e.*, between the time of Constantine and that of Charles the Great, the Roman buildings were not undergoing any development. The long series of Popes, from the beginning down to 774, the time of Charles's conquest, had done more in the way of conversion of existing buildings, or re-using old materials, than in attempting to erect new buildings. The basilica, with its long ranges of columns, ended with a throne or apse, afforded just the accommodation that was needed for Christian worship, and the multitude of old fragments available led for ages to the construction of buildings in which the whole of the details are antique, and in which the general form is founded also on an ancient one. The long ranges of columns of all sizes and sorts are often very imposing, but the interest of the churches is rather archæological than architec-

tural. The interest of the fragments of which they are constructed is great. They afford evidence of the slovenly execution of much Roman work, but at the same time of the freedom from all rule as to the exact dimensions, proportions, and decorations of the various orders. It is hardly too much to say that no two capitals in one of these buildings are alike, whilst the remains are, with few exceptions, of Ionic, Corinthian, and Composite, and not of Doric. Not the less were these buildings important links in the chain of development. The long lines of columns; the simple wall pierced with a clearstory above; the apse at the east end projected from a cross nave or transept, out of which other and smaller apses were formed on either side of the central one, formed a model which, as we shall see, was one of the principal foundations for the complete Romanesque buildings of the eleventh and twelfth centuries. And the buildings, — which still remain substantially on the old lines, as St. Paul without the walls of Rome, San Lorenzo, and St. John Lateran, — were repeated with more or less closeness at Ravenna, in the two churches dedicated to St. Apollinare at Aquileia, in San Miniato, Florence, San Zenone, Verona, and, last of all, in the ground plan of Pisa.

But if Rome was thus, as before, uninventive, this cannot be said of the city of Constantinople, where Constantine the Great established the seat of government in A.D. 330, *i. e.*, about fifty years after the erection of Diocletian's palace. Here the Romans were going back again to the East, and with an architectural result which has been one of the most remarkable in the whole history of development. Greek art had now for some centuries been all but completely thrust on one side by Roman, after the latter people had become the conquerors, and it was not until the foundation of Constantinople that it once more raised its head. The Greeks again exhibited their powers of invention in the Byzantine style, in which we see so many evidences of acquaintance with the architecture of Palestine. The churches,—now converted into mosques,—still existing in Constantinople are of various dates and of various stages of development. Constantine's first church was a Roman building, like the old Basilica of St. Peter at Rome, a long building, with wooden roofs, an eastern apse, and probably an atrium. All the ornamentation was internal, in place of external. It was burnt down in A.D. 531, in the time of Justinian, and so vigorous was the architect of the new church,—Anthemius,—that in forty days from the fire he laid the first stone of the new basilica, and completed the whole church in five years and ten months. The cupola is about 104 ft. across, about a fourth less than the Pantheon; but, then, it is carried on arches instead of on a continuous wall, and in constructive skill its architect was far before the man who built the Pantheon. At the same time (*circa* A.D. 530) SS. Sergius and Bacchus was built, and this has special interest, seeing that San Vitale at Ravenna, consecrated in 547, is on exactly the same plan and design; whilst in the somewhat late Church of St. Theodore, we have a plan copied almost exactly in Sta. Fosca Torcello. And here, though it is a little out of place, you must notice how completely Constantinople gave her art to Venice, not only in these early days, but down, at least, to the thirteenth century, when the Venetians attacked and sacked the city, and carried off as spoil most of the exquisite decorative work which we now see there, and, not least among this, the four antique Greek horses which stand over the portico of St. Mark's. Indeed, it is impossible to look at any part of the original work of St. Mark's without realising that scarcely a feature is indigenous, and that all is absolutely and wholly Byzantine in plan, in elevation, in detail, and in coloured ornament and decoration.

The construction of these Constantinopolitan domes is as interesting as their design. The cupolas are ingeniously buttressed and strengthened by semi-domes below the tambour, by cross arches and vaults and domes in the enclosing aisle. And the domes, instead of being constructed of heavy stonework, were built usually of hollow pots; and in the case of SS. Sergius and Bacchus, with eight great vaulting ribs rising from the centres of the arches to the centre of the dome, the spaces between the ribs being filled in with wagon-vaulting resting on them. This extreme constructive skill would alone deserve our highest respect, even if, at the same time, all the decorative details had not been, as they are, of a very refined character. No merely architectural carving of conventional foliage has ever excelled in effect or in technical skill the best works of this school, in which, for some four or five centuries, the same detail is very closely adhered to.

Another parallel stream of art must also be noticed, — in Syria. The examples of this, dating from the first to the seventh century of our era, are numerous, very perfect, and of the profoundest interest to the student. You will find a full and admirably illustrated description of them in Count de Vogüé's "Syrie Centrale," and I advise you to consult it in our library. Here, in part owing to the climate, in part to great solidity of construction, which was wholly of stone, and in part to the absolutely deserted state of most of the sites, time has dealt with a very gentle hand, and an astonishing number of examples of this most interesting period remain all but perfect in most of their details. The earliest are,—as might be expected in a Roman province,—generally imitations of Roman work. But by the fourth century the influence of the native Eastern art, closely allied to that which is seen in Constantinople soon after, is seen in a well-defined system of design and ornament which prevails in a large number of buildings, and which has so much in common with much later European work as to make one at first almost incredulous as to their great antiquity. This is, however, indubitable. The most interesting and typical examples for my present purpose are the church at Ezra, and the cathedral at Bosra, in the south of Syria, and the vast convent at Kalat Sem'an in the north, between Aleppo and Antioch. An inscription still remaining on the walls of Ezra shows that it was completed in A.D. 515, or about sixteen years before St. Sophia's was begun. Its plan is remarkable, as so many of these Syrian plans are, for its admirable arrangement. It is a square building on the outside and octangular inside, the angles being relieved by semicircular recesses covered with semi-domes. A small chancel is projected on one side, and within the octagonal nave eight columns and arches carry a quasi-dome or eight-sided vault of very pointed section, with the important feature of a tambour below it pierced with windows. Here, therefore, we have, though on a small scale, a construction which suggests, in a very definite way, the most advanced constructions of the European builders some centuries later. The plan, simple as it is, is very beautiful, and shows how extremely skilful these Syrian architects were. Even more striking is the cathedral at Bosra. This is on a far larger scale than the church at Ezra, but, unhappily, the central dome and the arcades which supported it have disappeared, and we are left to conjecture that it was the experience obtained in such works as this that led to the more stable construction of the domes in Constantinople. Here you must notice the remarkable love of the plan of a circle enclosed within a square, with a number of sunk semicircular recesses in the walls. The treatment of these, with columns carrying the wall above them, seems to be the connecting link between the recesses in the walls of the Pantheon, and the management of the semicircular recesses under the tambours of the Domes of Sta. Sophia and SS. Sergius and Bacchus. Even more remarkable than these churches is the vast convent at Kalat Sem'an, erected in the fifth century. Here, among a vast number of ruins of buildings attached to it, is still left so much of the grand church as enables us to form a fair idea of its general design. The plan is cruciform, with an octagonal centre, the walls of which are buttressed by cross arches contrived with extreme skill so as to be themselves supported by apsidal chapels in the four angles made by the junction of the four arms of the cross. The central octagon stands on eight arches, and there was no central dome, the church here being, in fact, a hypæthral building, built round the column of St. Simeon Stylites, which stood in the centre of the octagon. There is no building of which the date is more certain. St. Simeon died in 459. The base of the column on which he spent thirty-seven years of his life is still in its position. In 560 Evagrius visited the convent, and has left a most exact account of the building, which had been erected directly on St. Simeon's death, and his account agrees in every detail with the existing building. I can hardly express too strongly my sense of the singular excellence of this plan. Even with the recollections of Arnolfo's work under the dome in the cathedral at Florence, and of our own Alan of Walsingham's octagon at Ely, it is a very open question whether this far earlier treatment of the same problem is not more excellent than either. At Kalat Sem'an there are but few evidences of Roman influence. The long arcades of the four arms of the cross can hardly be said to be certainly derived from the basilica; and the great entrance at the end of the transept, three grand arches each with its own pediment, has no prototype, and is itself more than likely to have suggested the design of the very best French Romanesque, such as we see at St. Trophime at Arles. Then we find here a very regular system of window-decoration, of mouldings well adapted to their exact position, and outside the central apse we have a design which might almost be pronounced to be a work of the eleventh century, if we saw it some so-called Lombard church in the north of Italy or on the borders of the Rhine. It is divided on plan into regular bays by attached columns placed one over the other in two tiers, and in height by a cornice which is already treated as a mere string-course. At the summit arches springing from the caps of the columns support a cornice. These arches are somewhat large, but otherwise there is little to distinguish them from the Lombard corbel-tables of Pavia. Nothing more deserves notice than the really beautiful carved stonework of these buildings. It is truly Byzantine in character. The acanthus-leaf plays still a large part, but is treated with great variety of arrangement, and is supplemented by many charming designs of running ornaments, carved mouldings, and patterns in low relief, which speak well for the skill and taste of their designers. Not less noticeable is the fact that these buildings are almost wholly of stone. Stones of large size were obtainable, and floors are constructed by throwing arches across at intervals of a few feet and bridging the spaces by long horizontal blocks of stone exactly fitted together. It is about the most undying mode of construction ever seen in arched buildings. Nor are there any buildings in which the semicircular arch is more freely, more honestly used than it is in these.

It is not very difficult to connect this school with buildings in other parts of Europe. It is improbable that a flourishing province of the empire should keep entirely to itself such remarkable powers. M. de Vogué gives some examples of construction with parallel arches covered with flagstones, such as the baths of Diana at Nismes, an arch of the bridge at Narni, and a corridor in the arena of Arles. He asserts also that the tomb of Theodoric at Ravenna, built about 500 A.D., is really so akin to them in all its details of ornament and construction, that to him it seemed to be almost a Syrian work. And it certainly seems possible to trace a distinct influence of these Syrian buildings on not a few of the Romanesque buildings of the eleventh and twelfth centuries in the south of France, throughout the Rhine provinces, and in the east of Spain. The Syrian buildings, dating mainly from the fifth, sixth, and seventh centuries, must at that time have been seen by many in a perfect condition, and were so far in advance of European works of the same age as to make it certain that they would find imitators, who, however, with none but Roman works and traditions before them in their own country, would be likely, as a rule, to graft some of their features on to their own buildings without wholly abandoning the style of the latter. Doubtless the influence of these Syrian Byzantine architects was largely felt in the Holy Land; and it is incontestable that the influence of the Holy Land,—and particularly of the buildings in Jerusalem,—on European art was equally great, and too remarkable to be passed over. It was of a two-fold kind. Crusaders and pilgrims visited the holy places, and returned knowing somewhat of an art different from their own. Then wherever they formed communities or carried on trade in the East, they erected churches and other buildings for their own use and in their own style, modified by that of the country.

The Church of the Holy Sepulchre has been, as you all know, I dare say, a subject of much contention. But hardly any one now believes that there is any room for doubt as to its authenticity and antiquity; and to-night, at any rate, I must speak to you as though there were none. The church, as we now see it, is a collection of additions made from time to time to the original church built by Constantine. This was probably

a great basilica, with a long nave and double aisles and transepts; west of these a circular building open to the air in the centre,—very much as in the church of Kalat Sem'an,—where was a shrine over the sepulchre. This central space was divided from the surrounding aisle by a range of piers and columns. In the outer wall of the aisle were three circular projections or chapels. Here we have a most interesting plan, and one of which the outer wall still remains. At the latest it can hardly be a later work than the sixth century, but I see no reason for doubting that it is really the work of Constantine, and though the arrangement is unlike anything that we know of in his time, it is just such a shape as might naturally grow out of the special requirements of the case. Unhappily, in a restoration after a fire in the early part of this century, so much damage was done to this part of the building that it is now a little difficult to realise how venerable it is. The alterations made at various times have been great. First of all the nave was burnt, and in its place was erected in A.D. 1130 a choir with an eastern chevet and a dome over the crossing. The western side of the transepts then abutted on the circular church round the sepulchre. The architecture of the whole of this later work was thoroughly European. It was the work either of French or Spanish architects, and it is most interesting to see the exterior of its apse giving back to Jerusalem exactly the same outline as had first of all been there devised. The outline is a specially common one in the centre of France,—a great circular apse with three chapels and spaces between them for windows.

Close to the Church of the Sepulchre are other churches,—St. Helena, St. Mary, and St. Mary of the Latins, all of them evidently built by Europeans in the twelfth and beginning of the thirteenth centuries. At Bethlehem is a church which is probably also of the date of Constantine. It is a great basilica, with transepts, double aisles, and wooden roofs above a clear-story. The transepts and choir all end in apses, and may well be compared with the little tri-apsal church at the cemetery of St. Calixtus in Rome, of about the same date. The interest of this church is that it shows us the plan of a Christian church founded upon the Roman basilica before the Greeks had developed the construction of the dome. The Christians, when they had to choose between the form of a basilica and that of the ancient heathen temples, naturally chose the former. The old *cella* of the temple was narrow, dark, and meant only for the functions of the priest; whereas the Christian church had to be large, well-lighted, and open to the multitude, and this church at Bethlehem shows so clearly the way in which it was adapted to the purpose as to be well worth study. There is, indeed, a story of the ninth century which attributes this church to Justinian. It goes that when the architect who had been sent by him to build it returned to Constantinople, the emperor was so disgusted with his description of his work that he charged him first of all with malversation, and then finished by having him decapitated. This punishment has been suggested in our own day as a better mode of promoting good art than any other, and perhaps not very undeservedly. I fear, however, that there is no truth in the Justinian story, which only does credit to the originality of the narrator Eutychius. Justinian's principal works are known by contemporary description. They were Sta. Sophia, St. John at Damascus, and the Church of the Presentation at Jerusalem. They were all varied in design. In the first, everything was sacrificed to the dome; in the second and third, the dome and the basilica had been combined very much in the form in which they are seen throughout Germany and France down to the end of the twelfth century.

I have already told you how much Eastern art affected the art of the rest of Europe. But the Holy Sepulchre buildings had a singular influence. The religious interest in the site and history of the spot led men to wish to copy the elevation of the church, and, accordingly, we find a number of buildings avowedly intended to be repetitions of it. Perhaps the most curious of all these is the group of six churches founded at Bologna in 430, avowedly in imitation of the Holy Sepulchre. They are very small, and it is now difficult to see how they can be called copies, save in the one fact common to both of the cluster of churches in one group. A much closer imitation is the crypt of St. Benigne at Dijon. Here the outline was evidently most closely copied, and there was above it a similarly-planned church with a double aisle round the centre, which was open to the sky. The people in the triforium galleries and on the floor were thus able to look down into the crypt, and in this way a vast number of pilgrims were able to be present at one time.

The various churches of the Templars all over Europe were, in the same way, rough copies of the Holy Sepulchre Church. The Temple Church, and the round churches at Cambridge, Northampton, and Maplestead, all have a round church at the west end, corresponding with Constantine's circular church, and the choir projecting to the east, just as the later choir did at Jerusalem. So also have the Templars' Church at Segovia, and the fine church (not connected with the Templars) of St. Gereon, at Köln. In France the Church of Neuvy St. Sepulchre, built by Geoffrey, Viscount of Bourges, after a pilgrimage to the Holy Land, is not the only example of the same influence. The destroyed Church of the Temple in Paris, with its circular nave and long chancel, was probably the most beautiful there; though, on the whole, none can be found that excels our own Temple Church in this city, with which I hope all of you are well acquainted.

In Constantinople, at Jerusalem, and in Syria, we have had the work mainly of the period from the fourth to the eighth century. The next great epoch at which we might pause if time allowed is that which followed the coronation of Charles the Great, in the old and completely Romanesque Basilica of St. Peter, in the year 800. But it must suffice to say that constant, though generally hostile and warlike, intercourse with Italy was leading the Northern people to a more thorough realisation of what Roman art was than would have been possible from the study of the works which had been executed during the Roman occupation of their own countries. And it is clear that from this time began that stream of mixed Byzantine and Romanesque art which so steadily flowed for some two hundred years from the south northwards, and mainly on the two parallel lines of the Rhone to the centre of France, and the Rhine from the Alps through the centre of Germany.

The various influences which I have been describing had been gradually forming a style which was well defined, greatly advanced in constructive art, and full of variety. At times, as you will have gathered, it was swayed by the Byzantine influence of Venice and the East, at times by more distinctly Roman influence, and sometimes by that of Arab art. But, on the whole, I incline to give much more weight to the Byzantine share in the work than it is usually the fashion to give. Charles the Great evidently copied San Vitale and SS. Sergius and Bacchus in his minster at Aachen, and after its erection there grew up a series of magnificent churches in the Rhine country which had far more connexion with the East in their plan and general design than with Rome. In England and in Normandy, on the other hand, the style is more properly called Romanesque than anywhere, for from beginning to end our buildings of the earliest period show no knowledge whatever of Byzantine art, and when compared with the coeval buildings of Italy, of Germany, or of the south and west of France, they illustrate an entirely different phase of development. It can hardly be denied that far more skill and science was shown in those days in the South than in the North. We have grand buildings, but their decorations are coarse and their plans rude compared to those which are seen at Arles, at St. Gilles, at Poictiers, and elsewhere in countless French examples.

Undoubtedly there was an architectural influence at work in Great Britain which was but little connected with Rome. The early British Church was closely connected with that of Ireland. There we still see remains of extremely early churches or oratories, wholly distinct in style from either English or French Romanesque, and the architectural origin of which it is most difficult to account for. One feature, which is perhaps the most remarkable, is the construction of doors and windows with their jambs inclined towards the head, in Classic fashion. This is never seen in England, nor, I believe, in France, and certainly suggests a separate knowledge of Egyptian and Greek detail. It is not a little remarkable that this feature is carried on as late as the thirteenth century, and, as we shall see when we have to discuss our English architecture, it is from Ireland, probably, that we obtained our love for the square-ended churches which are so marked a feature in really English architecture, and so opposed to all the traditions of Roman and Byzantine art.

There is still something to be said about another potent foreign influence, which is seen in almost all early Italian buildings south of Rome. Few countries are blessed with a sea coast so extended in proportion to the population; and it is no matter for wonder, therefore, if the people were good sailors and good traders. No one can travel in those parts without finding features which are entirely new and unlike those in any other part of Europe. There is so great an infusion of an Arabic, combined with a Greek, element in both design and construction, that it is impossible to class the buildings with those erected under simply Roman influence. To the present day you may travel among villages and towns in Southern Italy whose houses are all covered with flat roofs, out of which small domes occasionally rise, and when you come to a church you will find that it has features entirely unlike any seen elsewhere in Europe. It may have a central dome adorned with intersecting arcades placed slightly in advance of the face of the wall; a tower pierced with lofty round-arched windows, with the openings either extremely stilted, or of horse-shoe shape; walls panelled with small pilasters at intervals, with lozenge-shaped panels of ornamental carving or inlaying placed below the arches which connect them. Arches are used for ornament only, as at Sta. Maria Ancona, where the whole façade is covered with arcades whose arches avowedly have nothing to do with the construction. It is difficult to explain in words the *bizarre* effect of these buildings. Their authors are to be looked for on the other side of the Mediterranean, but they affected in some respects the whole architecture of Italy, as, to mention one instance, the construction of pointed arches, in vast numbers of which the arch-stones or bricks are not made to radiate from the centre of the arch, being built with the same kind of feeling as in the Moorish arches in Spain, as, *e.g.*, in an arch at the Puerta del Sol, Toledo, which is for the greater part of its size not an arch at all, and which is of constant occurrence in all Spanish buildings erected under Moorish influence. The decoration, which is profuse, is wholly unlike real Romanesque work; and, as is usual in Arab work, it always has the look of being entirely used for the sake of its beauty and not for its utility, or as an ornament of the construction. Many of these features are found in the Greek churches of the same period, and it is natural, when we regard some passages in the history of the country, that such marks of foreign intercourse and influence should be seen. Down to the eleventh century the Greek Emperor had his lieutenant or capitan at Bari. The country was in turn occupied by Normans, by Saracens, and by the German Emperors. But at heart the population seems to have sympathised with Byzantine and Arab art far more than with Roman.

Down to the twelfth century, and even later, the whole south of Italy, and a considerable portion of Spain, were more or less identified with Arab art, either by reason of conquests by the Arabs, or by the importation of Saracen mercenaries. To give an instance. I remember seeing at Lucera a magnificent castle, in which, even so late as A.D. 1230, Frederick II. kept his Saracen soldiers. He was not a very Christian king, for, as his troops wanted a mosque, he converted the cathedral at Lucera into a mosque, turning the bishop out, and installing his Saracen mercenaries in his place!—a feat which made Dante condemn Frederick II. to purgatory.

The influence of the Moors upon the course of art in Spain is as remarkable as, but much better known than, the corresponding effect of the southern side of the Mediterranean on Italy. Here, in the earliest times, it was a point of honour with both Moor and Spaniard to build in his own style. But, as time wore on, and the Spaniard freed himself from the dominion which the Moors had exercised, the Moorish architects still remained in the country practising their national art until the time of the Inquisition, and each nation influenced the other. In the later Moorish work we see constantly a number of completely Gothic details introduced in a very picturesque fashion; and in the Christian buildings, from the end of the twelfth century, we meet equally frequently with pretty bits of distinctly Moorish detail in the midst of what is otherwise the purest Gothic. And wherever

the Spaniards used brick, as they did in a large part of the country from Toledo to Guadalajara, Saragoza, Calatayud, and Tarazona, the whole of it is a most interesting mixture of Moorish and Gothic, both in general design and detail.

Nowhere do we see more instances of the way in which architectural styles spread from one country to another than in the history of the Italian Republics. As an example, take the case of Genoa, which is a typical one, for there politics and trade, foreign conquest, mercenary warfare, and foreign travel, are features which meet us at every turn. The Crusades were utilised by its people for purposes of trade. They were among the greatest traders to the East from the time of the first Crusade to the fall of Acre, in 1291. They had, in many Eastern cities, their own streets, their own warehouses; and the riches of the East came, to a great extent, through their hands to Europe. They despatched vessels against the Saracens in the Balearic Isles and on the mainland of Spain, and obtained in return not only shiploads of booty, but also an annual Spanish tribute to the cathedral of San Lorenzo. Then, again, they had treaties with, and kept consuls at, Narbonne, Montpelier, Aiguemorte, and other Provençal towns. They went as far north as to the great fairs in Champagne, where they exchanged their goods with those of the manufacturers of Ypres, Bruges, and other northern towns; and they built larger ships expressly that they might carry their goods to the Hanse Towns, and even as far north as that singularly interesting trading depôt at Wisby in the Isle of Gothland. In the East they had consuls and warehouses at Trebizond and Kars, in Persia, and, above all, in Constantinople; and one result of their foreign connexions is seen in a singular episode of the joint Venetian and Genoese occupation of Eastern cities in the thirteenth century. We are told that two marble columns from St. Sabbas, at Acre, were sent to Venice, and erected in front of St. Mark's in the Piazzetta, after the Venetians, in a hand-to-hand fight with the Genoese in the church, had burnt their warehouses, and compelled them to take refuge in Tyre. This fight was only too common an Italian incident, for, as you know, the Italian Republics showed no mercy to each other. Pisa fought with and ruined Amalfi as early as the twelfth century. In the thirteenth century the Genoese, led by Oberto d'Oria, conquered Pisa in the great sea-fight at Meloria, and after destroying the chains which guarded the mouth of the Arno, brought them home in triumph, and hung them over their gateways, where, until our own day, they have remained. A hundred years later Venice fought a duel to the death with Genoa, and what little power was left to the latter was ultimately destroyed by the Visconti of Milan. Each one of these contests ended in something added to the artistic possessions or developments of both conquered and conqueror.

In France, the most fruitful source of development must, no doubt, be looked for in the Crusades, in which she had so large a share. An illustration of the effect of the intercourse which they promoted is seen in the case of Eudes de Montreuil, a famous architect of the thirteenth century, who went to the Holy Land with St. Louis, and built the fortifications of Jaffa. Another French architect, Jousselin de Corvault, also went to the East with St. Louis, but the only record of his work there is that he invented divers instruments of war. But upon the origin and development of French architecture I shall have so much to say in another lecture that I need not detain you upon it now. My object has been this evening to show you how possible it is to follow the growth of styles of architecture, and I hope I have also shown you how much interest there is in such investigations. Unless we make them we shall always be ignorant of the real history of old buildings, and unable to follow the course of their developments.

We have traced the progress of our art in the South and East, where in those days all the progress was being made. We are ready to go more into detail now in the rest of Europe, where in its later stages the developments of architecture left the South far behind. We have seen the growth of the art up to the time of Charlemagne. From his time until the fall of the Holy Roman Empire with Frederick II., 450 years elapsed, and during all that time Germany and Italy had been practically one country under one sovereign. Hence evidence of their union meets us at every turn in the early churches of the two countries. At Pavia and in Milan we are in presence of the same art, as at Mainz, Coblentz, and Köln. One illustration, and this of a singular kind, will suffice. The apse of such a building as the baptistery at Gravidona, close to the southern slopes of the Alps, is distinctly founded on the apse of St. Mark's at Venice. You will see by the plan the ingenious creation of three little apses in the thickness of the wall of the principal apse. To any one who had planned, or seen the plan of such an apse, it might occur that a piercing for a window should be made of the same outline, and just such windows we do find in the early churches on the Rhine.

The minor changes and varieties in German round-arched buildings are too many and too great to allow of my mentioning them now, though not so great as they were in the various parts of France. In those days France was formed by a number of provinces, each practically distinct from the other, so we see as many styles as there are provinces. The whole South is fairly uniform, but if you compare Normandy with Poitou, or either with Aquitaine, Alsace, the Ile de France, Champagne, and Burgundy, you will find, in fact, that the one thing common to all was the round arch, and a perfect freedom of developing whatever was required for convenience, for good construction, or for the demands of a different climate. I have left myself no time to show how this last requirement affected art. But when you consider that in the south of Europe a flat roof is the best covering, whilst in the north a steep one is a necessity; and that in the south a very small window is necessary, whilst in the north it can hardly be too large; you have two particulars which alone would account for an enormous change in style. They proceeded to modify and develop in a mode which was everywhere founded on common sense, and varied, therefore, in its developments in every country. This, indeed, is one of the great accomplishments to the architects of the twelfth and thirteenth centuries. The Greek architect had been, above all things, a worshipper of beauty for its own sake. A lovely line lost none of its loveliness for him by constant repetition. The Roman recognised the skill and taste of the Greek, and tried to copy his orders and his columns, forgetting that they were always the decorated features of a real construction. He treated architecture as an art which had nothing to do with building, and failed conspicuously in leaving anything that was very original, or much that was beautiful, behind him. The Byzantines took up the work, and to a great extent transformed it; but they inherited the old Greek idea of perfection, and spent ages in developing their designs. And then, in the eleventh century, came this new spirit, which made men suddenly conscious of the exceeding charm of variety, and of the power which the freest use of the arch gave them for securing it. Their art was that of men who were devising everything that they did with a reason. They adapted themselves to the requirements of convenience with a novelty of resource and invention which is astonishing the more it is looked into. They tried to build so that their work should last for ever. Mortals themselves, they never dreamt of making any work temporary and weak. By the middle of the twelfth century, therefore, it need not surprise us that their work bore its proper fruit, and that, after having discovered the practical use and convenience of the pointed arch, they soon invented and perfected a new style consequent upon its use, which, in rapidity of development, variety of resource, and real beauty, soon eclipsed all that had gone before. But this style lies outside my proper subject to-night, and in my next lecture I shall hope to show you how it affected Italian art. In that country one of the completest of the round-arched buildings was the cathedral at Pisa. If anywhere Roman influence should be felt, one would have supposed it would be there. But the Pisans were like their contemporaries the men of Genoa, of Amalfi, and of Venice,—resolute adventurers who went far afield,—and in A.D. 1050 they had made an expedition to Sicily. They had captured at sea a prize of extraordinary value, and they had taken Palermo from the Saracens who held it. Then, returning laden with their booty, their first and very pious idea was to build a magnificent cathedral, and so cosmopolitan were they, that they employed a Greek,—Boschetto by name,—as their architect. He built them certainly a magnificent church. But it was not Roman or Italian. It had the long ranges of columns of the basilica, but it had the Eastern dome, and in every detail throughout the work it is the Greek whose hand you see, and Byzantine architecture, not Romanesque, with some of the same flavour of Arabian art which we have been noticing in the more southern part of Italy. And it was under the shadow of its arcaded walls that the greatest architect of the thirteenth century was born and educated in his art.

It has been difficult to say anything like enough on my subject this evening. In all directions lines might be followed out far beyond what I have been able to attempt. But I am in hopes that I may have said enough to induce some of you at least to follow out these interesting subjects for yourselves. The course of art is like a stream with endless back currents and eddies, which interrupt us on our way. It takes us from Egypt to Greece, from Greece to Rome, thence to Grecian art again at Byzantium, to Syria and the Holy Land. Then it crosses again to Europe, taking possession of the south and west of France, and, joining two streams; one of mixed Byzantine and Roman from Ravenna and Venice, and the other of pure Romanesque from Rome, flows northward to the German Ocean. There these streams of art, rich in their combined developments, find another art establishing itself, founded upon an independent use of Roman work. At the same time, Moor and Christian are fighting for dear life in Spain, and wherever either plants his foot he builds in his own style, either in the most complete Moorish or in the severest Romanesque borrowed from his neighbours on the other side of the Pyrenees, but each showing occasional evidence in some part of the work of the influence of his enemy. In this progress of art it is difficult to say which has done most, the Church or the Sword. There had been a pause before what was supposed to be a fatal date, the year 1000. But when that was passed and the world had not come to an end, men breathed again, and began to build with renewed energy and enthusiasm. The circumstances of the age were all really in favour of the arts. For it is in countries which are establishing themselves, making their laws, cementing their polities, bringing their communities into order, that public spirit is at its highest point, and that art has its greatest opportunities and exercises the most fascination. In a highly-civilised state, where every one is satisfied, and there are no wars or rumours of wars, where life is easy, and men lazy and luxurious, it has a comparatively feeble influence.

In my succeeding lectures,—having brought you, as it were, to the threshold of the thirteenth century,—I hope to show you somewhat more in detail how the development worked out its course in Italy, in France, and in our own country. If we know so much we shall know almost enough, for in Germany and in Spain the distinctive art of the thirteenth century hardly ever existed. In Germany men were so proud of their early style that they troubled themselves as little as possible about any new one until the magnificence of an Amiens and a Beauvais forced them to an attempt at rivalry, only just completed, at Köln. And in Spain there was much the same enthusiasm for the earlier style, and when it was thought well to follow the new fashion it was for the most part by the hands of a Frenchman, and not of a Spaniard, that the work was done.

NORLAND WATERWORKS.

THE water supply of this village having been contaminated for some time back, a public inquiry was held, and the plans and sections of a scheme, submitted by Mr. T. L. Patchett, Halifax, were approved. The works, recently completed at a cost of 455*l.*, consist of a covered ventilating impounding reservoir, constructed on the edge of the moor adjacent to the noted "boiling" springs, which have also been covered in and connected to the reservoir. 4-in. cast-iron piping is carried across the moor and along the road to the village, as far as the Blue Ball Inn, a distance of 1,192 lineal yards, and then continued forward by 3-in. piping to the lower extremity of the district. A loop-line of main supply-pipes is also carried for a distance of 543 lineal yards round by the church. Public wells are put down at convenient places, as well as branches from the main, arranged to the various properties, and provision is made for fixing hose and jet.

SCULPTURE IN PARTS.

THE value attached to a statue being in one piece of marble is apparently in degree connected with the idea of difficulty overcome, especially in the case of an elaborate work. In a true fine-art sense, however, the work is just as worthy, if it be executed in several pieces, as in one, so that their union is firm, and so perfect that their junctions are invisible. Nevertheless, this view is not perhaps adapted for general acceptance by the many.

Nor, indeed, are the examples of various of our most prized works of ancient sculpture, which, when discovered, were broken in several pieces, but have since been united and restored, exactly to the point; as, for instance, the Medicean Venus and the Belvedere Apollo, as it may be alleged that they would be still more valued had they been found in a perfect state. Nevertheless, it may not be altogether beside the mark to allude to them before adverting to some ancient works which were originally and advisedly executed in more than one piece.

Also, it may be well to mention the great group of the *Toro Farnese* at Naples, which consists of a composition of Dirce and the bull, and three other figures, being the largest group we have remaining of ancient art, and which Pliny records to have been made in one block. Although this colossal work has had to be much repaired and restored in consequence of the great fractures it had received, its present condition appears to support that statement, or, at any rate, not to disprove it.

There exists, however, a still more celebrated group of ancient sculpture, in respect to which the same author gives a similar report, namely, that it was in one block, which statement, however, does not seem to be equally correct. This is the work of which he speaks as being the greatest achievement of ancient art,—"*Opus omnibus et picturæ et statuariæ artis præponendum.*" It is stated, however, by those who have had the opportunity of closely examining this noble group of which he thus speaks,—the Laocöon and his two sons, in the Belvedere Court of the Vatican,—that it is composed of six blocks. These are, however, so judiciously and artfully fitted and combined together that the visitor does not observe the divisions, this harmonious union, being favoured by the nature and elements of the group, and by the convolutions of the serpents crossing the limbs of the figures; lending thereby facilities for these arrangements of parts, by affording lines and shadows which conceal the junctions. And these dispositions may well be held to form part of the artistic intelligence with which this grand group, of a father and his two sons perishing together in the fatal folds of the sea-monsters, was originally composed.

There may be some divergence of opinion as to the exact number of original blocks of marble to be distinguished in this triumph of ancient Greek sculpture, inasmuch as this consideration may be, in some degree, embarrassed by the restorations added to it since its discovery. Still, however, it appears evident that the group, the Laocöon, now in the Vatican, is not only the original work from the chisels of Polydorus, Athenodorus, and Agesander, but that it not only now is, but was originally, at the time of its production, not in one piece of marble, but composed of several, so artificially united, however, as to defy detection except by the eyes of an expert.

How, then, is the statement of Pliny, that it was in one block, to be reconciled with existing facts? It has been said of this amiable, voluminous, and erudite author, that he was too ready to adopt, and record general reports, even without the reservation of Herodotus, of "they say so." Some even have ventured to pronounce him an engaging gossip, facile in adopting the gossip of others. Nevertheless we owe him a great debt of gratitude for the mass of interesting information, not only on art, but on a variety of other subjects, which he has preserved, and which, but for him, would have been lost to us. Evidently, also, whatever he narrates and records is in good faith, and, being under such obligations to him, we may well seek for such interpretation of what he says as may reconcile it with fact.

The solution of the discrepancy, for which the occasion may appear to give room, is this,—namely, although the group is composed of six pieces, that these all formed portions originally of one block, which was divided, in the process of the work, for the sake of the more convenient workmanship of the parts, which, when they had been completely wrought, were re-united as they now appear.

There are three considerations which may have weight in this question. In the first instance, the block of marble available, although of beautiful quality, may not have been of a suitable shape for the execution of the group, without being divided to suit its conformation. Secondly, all its parts being from one block, would ensure a certain homogeneity in the quality, texture, and tint of the material, very difficult otherwise to attain, and also would admit of the sculptors escaping any dark vein which might be likely to have occurred, somewhere or other, in so large a block as would furnish marble for a work so extensive. To this may be added a certain poetic satisfaction to the sculptors, or their employers, in being able to say that all the figures were from one block. If anything like special pleading be charged against this solution of the question, it may be set down to the love we bear to the memory of dear, enthusiastic, and learned Pliny. But, on the other hand, it may be hoped that no such excuse will be deemed necessary, and that the above suggestion may appear feasible.

At any rate, experts assert that this group was originally, and now is, composed of six pieces; and thus much authority does this antique thus yield to the practice, in such elaborate and large works, of composing them in the same manner. But how far, it may be asked, was this method followed in respect to single statues?

In respect to this point there is notably one class of marble figures, which, apparently, when of heroic dimensions, were by the ancients not unusually worked in two pieces, even when no complication of workmanship called for such facilities in the execution. Of this method two of the finest female antique statues extant yield examples, namely, the celebrated mutilated statue of the Venus of Melos in the Louvre, and the equally beautiful Townley Venus in the British Museum, both of which works are in two pieces.

In both these figures a mode of design was adopted which appears to have been frequent in the representations of goddesses in Greek sculpture, namely, the upper part only is nude, and the lower half is draped, and this arrangement evidently favoured this treatment in two blocks, as the junction of the drapery with the nude portion of the statue, immediately across the centre of the figure, yielded a ready facility for concealing the line of union; and assuredly neither of these two works is in any degree less satisfactory or valuable because it is composed of two pieces of marble.

It does not, indeed, appear that the ancient Greeks really attached value to their statues being in one piece, or they would scarcely have adopted the chryselephantine method in regard to the presiding statues of their divinities in their principal temples, inasmuch as in that class of work the whole flesh surface was perforce formed of a number of pieces of ivory, inlaid together, so as to form a skin of ivory over a substructure of wood and metal.

In large groups it is evident that much facility is afforded toward their execution in marble if it be accepted that they may be made in parts. Still, however, as straight and horizontal lines of junction, which can scarcely be devised so as to be hidden, are to be avoided, as presenting the idea of masonry, and injuring the ease and life-like effect of the composition, it is desirable that the joints be disposed and formed in such a manner and in such lines and situations that they may be, as much as possible, concealed by the shadows and indentations of the surface, offered by the limbs and folds of drapery of the design, so that they may not attract or offend the eye.

In sculptural works in wood, it is quite an accredited practice that they should be put together in parts, as in the groups of game and foliage of Grinling Gibbons and others. Indeed, in such subjects the work is made more lasting thereby, as the direction of the grain of the wood can be so disposed as to render many of the parts more durable than if they had been carved all in one piece. In the wing of a bird, for instance, if the grain of the wood goes the way of the feathers, it is rendered much stronger than if it were across, and the same observation applies, of course, to any other delicate and tender detail of the composition.

This point of superiority of this method of dealing with material cannot of course be urged with equal force in respect to marble as wood, inasmuch as marble has not so decided a grain; still, all marble has, more or less, a grain, and in delicate parts, such as the separated fingers of a female hand, there may be a difference of strength, as of three to one, between the direction of the grain of the marble coinciding with their length, or being across them the narrow way.

That a marble statue being in one piece will ever have a certain prestige, there is no doubt; and the more so when it is very elaborate, as then it is a feat of workmanship as well as of art. It then becomes a *tour de force*, like the Chinese concentric hollow balls, one worked within the other out of one piece, when genuine, and thus has a double claim upon the admiration of beholders. Nevertheless, for the true lover of fine art in its simple essence, these self-imposed fetters of production will have but little charm.

The conclusion which may be arrived at is, perhaps, this,—that when the work can be executed to the same pitch of beauty and completeness in one piece of marble as if it were divided in two or more, it thus gains a certain meed of general admiration, which may be worth obtaining. While, on the other hand, if any sacrifice of detail, or thoroughness, or finish be thereby involved, it would be preferable, and more conscientious and upright in art, to execute the work in such a way as may insure the finest effect and most perfect result, without regard to its being wrought in one or more pieces. Nevertheless, homogeneity of texture and tint would doubtless be most satisfactorily attained by all these pieces having been originally constituent parts of one block.

GOSSIP FROM ABROAD.

AN eminent French man of letters has recently suggested that there should be organised a Minister of Public Relief. The proposal was made in the course of a lecture on the much-vexed question of the position of women in our modern society. In such a department of the Government, women, it was urged by M. Legouvé, should take an active part, one in which the sense of devotion, so marked a feature of woman's character, would place at her disposal the means of taking that share in the active duties of life which it is now claimed that women have a right to demand. In the great work of charity women have ever been foremost,—the history of Christianity shows us this fact conspicuously proved. Here is a field in which they may show that equality a large section of their sex so imperiously demand. The army of volunteers whose mission it is to combat misery, want of due attention to sanitary care, improvidence, and vice, is one whose ranks are ever open, and in which, if there be need of officers, and consequently superiors, a strict equality reigns; but the leading places in such a fight would be, as we see them so often, taken by women. All this M. Legouvé must have had in view, it is easy to see from the tenor of those phrases he devoted to the consideration of this side of the now so-much-discussed position which women may take in our modern society. The apostolate of the world will never be wanting in St. Peters ready to draw the sword, nor in St. Pauls gifted with entrancing eloquence of speech, but to aid in the accomplishment of their task is wanting the touching voice of the well-beloved disciple of Christ, of him who preached the doctrine of brotherly affection; the sole legitimate heirs of St. John are women.

If the saying be true, and custom has certainly long sanctioned in all countries its acceptance, that charity commences at home, no excuse need be considered necessary, after referring to charity as a general virtue, in speaking of the various benevolent societies whose aim it is to assist worthy artists and professional men or their distressed families. Unceasingly active as we know their directing bodies to be in discharge of their cheering duties, the "sinews of war" are ever deficient; but are there not means by which the requirement might be more largely supplied? The yearly reminders to the more prosperous brethren of the profession, successful as they are in gathering together large sums, might not their aim be materially assisted by the recurrence to other means by which the general public might be made to take upon themselves a share in the charitable work? We are justified by facts in the belief that the organisation of posthumous exhibitions of the

works of recently-deceased artists would place in the hands of committees of the various benevolent societies sums which would enable them to extend the field of their charitable action. In France, the artists' benevolent society known as the "Association Taylor" (from its now deceased founder, Baron Taylor) has, by means of such posthumous exhibitions, been able in a number of cases to supply the widows or families of artists with, if not very princely aid, sufficient means to fight against the trials of an utterly unprovided existence. The artistic world in Paris look back with pleasure to the recollection of these exhibitions, the peculiar charm of which consisted in their bringing together a large number of the works of one man. It will be long before the exhibition will be forgotten that was organised after the death of Corot, or those of the works of Ary Scheffer, Delacroix, Troyon, and of Flandrin; the delightful exhibition of the works of Prud'hon, to provide a pension for his still-surviving daughter; or of those of the works of Paul Baudry and of Fromentin. The feasibility of this plan has been sadly enough suggested by the recent death of the old Academician, Elmore, whose loss in the artistic world will long socially be felt by all who were in any way brought into contact with him. Why should not an exhibition of the works and sketches of deceased artists be made, the proceeds of which might go to swell the ever-insufficient fund of the benevolent societies? Apart from the charitable object attained, would not many interesting facts be thus arrived at? And might not the trade,—a feature to be considered in the present condition of our English art,—might not they find their interests advanced by such a step? Nor should in such a scheme the works of deceased architects be neglected; indeed, were an exhibition to be at present organised of the many exquisite drawings by eminent, and, in many cases, scarcely known, architects, that exist in private hands, the pecuniary, apart from the artistic, success of such an exhibition could scarcely fail to add to the disposable funds of the artists' benevolent societies.

In the propagation of sound common-sense notions, in bringing forward many a humble inventor and establishing a wholesome emulation, and enabling professional critics to exactly judge the relative merits of various inventions in ventilating many subjects that would otherwise have been left unconsidered, it is undoubted that the specialised exhibitions of the last few years have rendered immense service to the community.

The recent publication by the French Government of the detailed plans, sections and elevations of the Exhibition buildings of the Paris Show of 1878 will therefore, perhaps, prove of service to many members of the profession. Such, at least, has been the belief of the French Minister of Public Works. The text and plans of this publication exactly explain the modes in which the difficulties which presented themselves were solved, from the commencement of the works to their completion.

Of the exhibitions to take place this year abroad, we may, of course, be sure that we shall hear a good deal of the Frankfort Exhibition of Patents, of the Building Exhibition at Brunswick, the general exhibition at Milan and that at Madrid; it will, however, be found, we believe, that we have the most to learn from the Electric Exhibition at Paris, where England will be well represented. A number of important questions of a novel nature are to be there studied. One of the most prominent branches of hygiene, the question of light, will receive no small share of attention. We are to see experiments made upon the system of lighting houses, manufactories, workshops, school-rooms, and the theatre, which cannot fail to elicit some startling facts, that will lead to some equally startling reforms. Should the experiment of lighting a theatre by electricity prove successful, a positive revolution will have been effected. We not long since heard the Paris Opera House very wittily termed by a French dramatic critic the "conservatoire of catarrhs." How many a fatal case of malady which the doctor is powerless to treat has had its first stage in the draughts of our ill-constructed theatres! What inconvenience, apart from such danger, have we not all suffered! What fires have occurred! What injury from a financial point of view to the pretty decorations and figured ceilings! We seem promised, in fact, a return to the theatrical enjoyment of our classic ancestors. Were it not that prophecy, where one is not perfectly sure of what is about to occur, is unwise, we might, under the new conditions, predict an even larger interest on the part of the public in theatrical amusements than exists at present. In the matter of household lighting perhaps some of the questions relating to the many dangers and nuisances connected with gas-pipes may receive a satisfactory solution in the course of the forthcoming exhibition, where we are to see a number of domestic contrivances in which electricity is to be employed.

INDUSTRIAL PARTNERSHIPS: THE LABOUR QUESTION.

MISS HART has been reading a paper on the life and doings of Leclaire, the Paris painter and decorator, of whose establishment and arrangements the *Builder*, many years ago, first gave particulars to this country founded on information obtained from himself. On another evening the paper was discussed, and Mr. E. C. Robins, at whose house this took place, opened the proceedings with a brief view of the salient points of Leclaire's system. The facts are not unknown to our readers, but may be usefully repeated.

Leclaire took seven years to elaborate a practical scheme by which it might be the interest of both master and man to give the best material and workmanship for the least profitable price. He calculated that working in this spirit every workman could increase the profits of the concern by at least 8½d. a day, which would be a gain of 10*l.* 4s. 2d. per man, and as he had 300 men in his employ this meant the formation of a reserve fund of 3,000*l.* a year.

His first step, in 1838, was the formation of a mutual aid society,—the subscription being 1s. 8d. a month, entitling members to 1s. 8d. a day during the first three months of sickness, and gratuitous medical aid,—which, if the members so decided, should be wound up at the end of fifteen years, and the assets divided. His next step was taken in 1839, when he began to allow extra pay of 1s. 8d. a day to the chief workmen, 5d. to the under foreman, and 2½d. to those men who had been two years in his employ,—equivalent to a bonus of 25*l.*, 6*l.* 5s., and 3*l.* 2s. 6d. respectively, at the end of each year's labour. In 1842 he thus divided between forty-four workmen 475*l.*; in 1843, 490*l.* among the same number. In 1844 he divided 788*l.* among eighty-two men.

Finding that 30 per cent., or nearly one-third, of the sickness among his men arose from painters' colic, — incidental to the use of white-lead,—he introduced white of zinc, and at the present time three-fourths of the paint used in Paris is made from white of zinc instead of white-lead, which earned him a gold medal from the Society for the Encouragement of Good, and the Cross of the Legion of Honour from the Government.

In 1853,—fifteen years after the establishment of the Mutual Aid Society,—it was dissolved, and the twenty-nine members surviving each receiving his share of the assets, amounting to 21*l.* 15s. each. In 1854, it was re-established upon a new basis. No subscription was required, but the bulk of its capital was granted by Leclaire out of the profits of the business during his pleasure. In 1860 a capital of 1,600*l.* had accumulated. In 1863 Leclaire made up the capital to 4,000*l.*, to show his appreciation of the men yielding to his wish to make it a permanent institution, instead of winding it up every fifteen years. Henceforth this society was regarded in the light of a sleeping partner, and received 5 per cent. on its capital, while it was allotted 20 per cent. on the annual profits. Thirty per cent. was divided among the workmen individually, and 20 per cent. collectively, as members of the society. The remaining 50 per cent., or half the profits, was retained by Leclaire, or any partner he might associate with himself. In 1864 Leclaire said to his men:—"As members of the Mutual Aid Society, you are no longer day-labourers, working like machines, leaving off work before the hour has done striking. You are partners working on your own account, and as such nothing in the workshop can be indifferent to you. Every one of you ought to look after the plant and materials as if you had been specially appointed guardians of them."

On the death of his wife, in 1865, Leclaire retired to Herblay, near Paris, where he became mayor, and inaugurated many reforms, and M. Alfred Defourneaux succeeded him in the management. In 1869 Leclaire retired from the business, which was carried on in his name only. The working capital was fixed at 16,000*l.* Leclaire contributed 4,000*l.*; Defourneaux, 4,000*l.*; the Mutual Aid Society, representing the interest of the workmen, 8,000*l.* The first charge on the profits was 10 per cent., to go to a reserve fund. Next, 5 per cent. interest on the subscribed capital; after which 25 per cent. to Defourneaux, as acting manager, and 75 per cent. to the officials and workmen; 50 per cent. of which was divided amongst them individually in proportion to their earnings, and 25 per cent. collectively in the shape of a subvention to the Mutual Aid Society, Leclaire receiving only his 5 per cent. interest on his share of the subscribed capital. The select body of skilled workmen were termed the "Noyau,"—nucleus or kernel. To be eligible to the "Noyau," a workman must be between twenty-five and forty, of unblemished moral character, of good general education, and proved technical capacity. Members of the Mutual Aid Society were *ex officio* members of the "Noyau." To it was entrusted the election of the foremen and managing partners,—of which there were two,—and the committee of conciliation.

In 1872, Leclaire died worth 48,000*l.*, having divided 44,000*l.* among his workpeople, and Redonby succeeded him. In 1875 Margnot succeeded Defourneaux, who died. In 1877, 984 workmen shared in the profits, about 450 men being at work at the same time. Nearly 40,000*l.* was paid in wages that year; and, since 1842, 80,000*l.* have been divided as the men's share of the profits. The capital in 1877 was 40,394*l.*, and the business done was 80,000*l.* The Mutual Aid Society has 24 male pensioners, receiving 40*l.* a year each, and 11 widows 20*l.* each. Such has been the gradual growth of this remarkable institution.

A society is about to be established to collect information and to translate foreign works on the subject, and to familiarise the people of England with the idea that it is not absolutely necessary that the present state of antagonism should last for ever; that neither masters nor men need to think only on their separate interests to secure success; but that sympathy with each other's aims is more likely to realise the best result. If it be true, as Mr. George Howell asserted at the meeting, that fully 20 per cent. is lost by waste of time and waste of material, from want of interest in the workman in the work he engages, it is obvious that any system which can bridge over this antagonism, and make it mutually advantageous to do the most work in the best manner, and in the shortest time, is one which should command the attention of every well-wisher of his country. Mr. Howell thinks the unions would not be averse to any reasonable proposition made by the masters, which he thinks would be more to their interest than forcing the men into co-operative relations to gain their own ends irrespective of the masters.

THE ARTIST AND THE FORGER.

ART has a field and a value of its own, of which none are competent to speak whose lips have not, in some degree, been touched by the sacred fire from the altar. Attempts have been too often made to enhance the claims of art by insisting on the monetary value of art products, or by seeking to convince the ordinary workman that it would pay him better to be an artist. With these views broadly put we have no sympathy; we regard them as mischievous rather than as useful. But it is another thing to point out that art has not only an ennobling but also a protective character. The best method of preventing forgery and of setting the counterfeiter at defiance, is to produce work of so thoroughly artistic a character that it cannot be imitated except by an artist of exceptional merit. As to this we were under the apprehension that it had been long admitted. In many places, no doubt, that is so. We regret to find that education in that respect is more limited than we had supposed. Bankers, generally, have come to the conclusion that, while they must rely to a great extent on chemical science for the protection of their monetary documents, the first guarantee against the forging of a bank-note or cheque is the thoroughly artistic character of its execution. Such, certainly, is the case with the Bank of England. In the first place this establishment has, at a large cost, provided for its notes

a paper which is inimitable, except at such cost and under such conditions as have never yet been commanded by a forger. Then it puts upon this paper,—of every blank sheet of which it takes as exact care as of the Bank-notes when printed,—a piece of the finest engraving that can be executed by the art of the engraver. Thirdly, it adds certain private marks and notes, by the observance of which it would be possible to detect a spurious imitation, even if paper and engraving were fairly copied. The result is, that while individuals may,—very rarely,—be deceived by spurious Bank of England notes, it is impossible, humanly speaking, for the Bank itself to be so deceived.

When it was proposed to offer to the public something which forms, in fact, a new paper currency for small amounts, it was to be expected that these considerations and this example would be borne in mind. The idea of a ready postage currency has very much to recommend it. But the new orders have the appearance of being the result of a competitive offer to country printers to produce the cheapest work possible, excellence of design and of execution being left out of sight, and everything being subordinate to the one virtue of cheapness. We earnestly hope that we are wrong; but we fear that the new Post Office orders will prove a great temptation to forgery. In the old system the plan of double advice made forgery impracticable. In the new, the public and the Post Office have nothing on which to rely except the note itself. There is not even the check of signature, as any name may be invented, and any signature of that name appended. It is, therefore, on the excellence of the order itself that all check depends. As to this, it seems to us that the forms are little other than premiums for forgery; and we do not say this without consultation with persons of high authority in postal matters. The greatest care will be necessary to prevent immediate and wholesale depredation.

If we had the least reason to suppose that any of those light-fingered gentry who devote to evil modes of obtaining money a degree of ingenuity, skill, and patience that would have been enough, if rightly directed, to give them high or even honourable positions in life, would wait for any hint on the subject, we should have thought it better to be silent than to utter a warning that might be heard by two parties. But no such need for reserve exists. The first idea that occurs to the mind of a sharper, on the occurrence of any change in the machinery of credit, is how to take advantage of it. How to do so, in the present instance, is only too obvious. How to avoid the michief is less discernible. We can only hope that these cheap forms will be replaced by something safer, with the least possible delay.

SOME UNPROFESSIONAL MEMORIES OF THE BROTHERS ADAM.

MAITLAND, in his "Perambulations of Divers Miles round Edinburgh," writes, "Underneath the hill whereon Inveresk is situated, is a curious piece of art made on the following occasion. William Adam, of Edinburgh, architect, having erected a Coal Work at Pinkie (in the neighbourhood of Inveresk), in the year 1739, whereoutof he extracted the water by a Horse Machine; but this method proving inconvenient, and too expensive, he resolved to erect a Water Engine for the same purpose, for the supplying of which with water he determined to cut an Acqueduct through the hill whereon Inveresk stands," &c. This aqueduct or tunnel was a formidable undertaking, which was carried out in every detail by Adam. This extract proves Adam's skill in engineering, but it is far more interesting when taken in connexion with his sons, Robert and James; for, while he was at Inveresk, the boys formed a friendship, never to be dissolved except by death, with Alexander Carlyle, the son of the clergyman of Prestonpans, a neighbouring village. It was of this son that Sir Walter Scott wrote, in after years, "The grandest demigod I ever saw was Dr. Carlyle, minister of Musselburgh, commonly called Jupiter Carlyle, and a shrewd clever old carle was he, no doubt, but no more a poet than his precentor." Carlyle, in his delightful "Autobiography," describes one of his visits to London. Through the intimacy between Home, the author of "Douglas," and Garrick, the latter invited Carlyle and his friends to dinner at his house at Hampton. "Garrick met us by the way, so impatient he seemed to be for his company. There were John Home, Robertson (the historian), and Wedderburn, and Robert and James Adam." (Space will not permit even the briefest glance at the many receptions of Carlyle and his friends in London.) "Our time drew near for returning [to Scotland], which we were to do on horseback, and with that we set about furnishing ourselves with horses. We had some inclination to be introduced to Lord Bute, which John [Home] promised to do; and for Robert Adam also, who could derive more benefit from it than any of us. Robert had been three years in Italy, and, with a first-rate genius for his profession, had seen and studied everything, and was in the highest esteem among foreign artists. From the time of his return, viz., in February or March, 1758, may be dated a very remarkable improvement in building and furniture, and even stoneware, in London and every part of England."——"The day came when we were presented to Lord Bute, but our reception was so dry and cold that when he asked when we were to go North, one of us said to-morrow. He received us booted and spurred, which in those days was a certain signal for going a-riding, and an apology for not desiring us to sit down. We very soon took our leave, and no sooner were we out of hearing than Robert Adam, who was with us, fell a-cursing and swearing. 'What! had he been presented to all the princes in Italy and France, and most graciously received, to come and be treated with such distance and pride by the youngest earl but one in all Scotland?' They were better friends afterwards, and Robert found him a kind patron when his professional merit was made known to him."

The London visit comes to an end, and, mounted on horseback, the four travellers set forth on their journey to the North. "As the Adams were a wonderfully loving family, and their youngest brother, James, was going down with us, the rest of the sisters and brothers would accompany us as far as Uxbridge,—a very needless ceremony, some of us thought." "We arrived at Oxford before dinner, and put up at the Angel Inn. Robertson and Adam, who had never been there before, had everything to see." The travellers were all so delighted with Oxford, and the kindly entertainment they received from the Fellows, that they prolonged their stay for two days. "Next morning we set out early for Woodstock, where we breakfasted, and went to see Blenheim, a most magnificent park, indeed. We narrowly inspected the house and chapel, which, though much cried down by the Tory wits of Queen Anne's reign, appeared to us very magnificent, and worthy of the donors and of the occasion on which it was given. Our companion, James Adam, had seen all the splendid palaces of Italy, and though he did not say that Sir John Vanbrugh's design was faultless, yet he said it ill deserved the aspersions laid upon it, for he had seen few palaces where there was more movement, as he called it, than at Blenheim." Pleasantly the days pass away. The travellers look in at the Leasowes, and have a chat with Shenstone, visit Lord Littleton's, call at Burton-on-Trent, "where we could get no drinkable ale"; then onwards, by Chatsworth, Studley Park, and so on until "we discovered we were like to run short." Reaching Newcastle, a townsman and friend of Carlyle refills their purses. They rush into extravagance, and Adam lays out 20*l.* on a horse. The pleasant journey is about to end. "We seldom got on horseback before ten o'clock; for there was no getting Robertson and Home to bed, and Jamie Adam could not get up, and had, besides, a very tedious toilet. Our two friends wanted sometimes to go on before us, but I would not pay the bill till James and Anthony [the servant] were both ready." What might be the conversation that kept Robertson and Home over their claret so far into the night? The former eulogising the beauty and accomplishments of the unfortunate Queen Mary; the latter recounting his adventures when he followed the banner of "Bonnie Prince Charlie," and his escape from the dungeons of Doune Castle? And Carlyle and Adam, as they jogged alongside, which was their wont, doubtless discussed the merits of the European centres of art, or recalled the days when, boys together, they angled in the silvery Esk, or gathered brambles on the battle-plain of Pinkie.

On entering Scotland the travellers parted, and Carlyle thus concludes the story of their adventures on the route from London to the Border: "James Adam, though not so bold and superior an artist as his brother Robert, was a well-informed, good, sensible man, and furnished me with excellent conversation, as we generally rode together. Thus ended a journey of eighteen days, which, on the whole, had passed so amusing and satisfactory."

And now for the sequel. Robert Adam died in 1792, and among the mourners that stood round his grave in Westminster Abbey were David Hume, Adam Smith, Adam Ferguson, Earl Mansfield, and Charles Townsend,—all of them bosom friends of Carlyle. In the *London Chronicle* of October 22, 1794, is this paragraph: "Died, in an apoplectic fit, James Adam, Esq., of Albemarle-street, architect. Besides his excellent treatise on Agriculture, Mr. Adam was preparing for the press a history of Architecture, which all lovers of the Art have reason to lament he did not finish." Carlyle died near Edinburgh, in 1805, at the age of eighty-three. And so passed away the little band who made the descent upon London in that sunny May of 1768.

In addition to the fresh matter we have given in aid of a more complete account of the Adam family than now exists, we add a letter from Robert Adam addressed to the Honourable Henry Home, of Kames, one of the Senators of the College of Justice, and one of the Lords Commissioners of Justiciary in Scotland, which we stumbled over in a now little-known work, "Memoirs of the Life and Writings of Henry Home, Lord Kames, 2 vols. 4to. Edinburgh, 1807," written by Alexander Fraser Tytler, Lord Woodhouselee. Lord Kames, in his "Elements of Criticism," while dealing with architecture in reference to the orders, almost repeats the words of Adam:—

"London, 31st March, 1763.

My Lord,—I am ashamed to say I have had the honour of your letter of the 2nd ult. so long without its being in my power to answer it sooner. The practice of architecture rushes so fast upon me, that I have but too few moments to dedicate to theory and speculation. Your lordship's ideas with regard to the improprieties of the Doric and Corinthian orders, seem at first too well founded; but, upon considering the nature of these orders more fully, and reflecting how an architect of superior abilities would dispose of them, I am convinced the strength of your objections would vanish, I may say, entirely as to the first, and in a great measure be removed as to the second of these orders.

If you wish that the Doric order should appear simple and solid, you ought not to flute your columns, nor carve any of the mouldings of your capitals and bases; keep the entablature of the plainest kind, no guttæ to your mutules, no ornaments in your metops: in which case you will find no one part too much or too little ornamented for the others; and I have already experienced this in many buildings I have executed. If you flute your columns, you must then enrich your capitals and bases, carve your cornices, and put ornaments on the metops of the frieze. This degree of enrichment I would seldom use without doors; but it is very proper in halls, inside of temples, &c. I have ventured to altar some parts of this order, particularly in its mouldings; rejecting some of the common ones, and adopting or substituting others in their stead. These alterations, most people have allowed to be much for the better; but I have always been very cautious in this way, and it is a dangerous licence, and may do much harm in the hands of rash innovators, or mere retailers in the art, who have neither eyes nor judgment.

The capital of the Corinthian order demands delicacy and richness in every other part belonging to that order, and when that necessary profusion of ornament cannot be afforded, the architect ought to reject this order altogether. The fable of Callimachus, the basket, and acanthus-leaves I never had any faith in. The Egyptians had a kind of Corinthian order, and in many parts so similar to that which the Grecians used, that we cannot doubt of the latter having only changed or improved (as they imagined) many parts of the Egyptian capital. If your lordship will look into Norden's 'Antiquities of Egypt,' you will see the capitals I refer to. I own that there appears an absurdity in supporting any weight by a combined cluster of light foliage; but if you suppose a column to represent a tree, I shall suppose a palm-tree, which grows of a pretty equal thickness, and of

which the branches grow near the top, and that part of the top of the tree is cut off, and the branches or leaves left: you will find that tree able to support a weight, and these branches by no means imparing its strength, nor in any danger of being broken off. They will bend down their heads with the beam or entablature that lies upon them and connects them together, as those of the Corinthian capital do, but the main weight will still rest for its support upon the upright stem. This I take to be the true origin of the Corinthian order. Some other leaf has been substituted as more beautiful than that of the palm or any other tree which grows in that manner, and by degrees the acanthus has prevailed. Many trees grow 20 ft. or 30 ft. high in one stem, then split into two or three large boughs. If you cut the tree 2 ft. or 3 ft. above the separation of these boughs, it occasions that swell at the top which gives the appearance of the basket or base your lordship mentions, which all architects have split upon, resorting to this foolish fable, when it may be accounted for in the simple and natural manner I have mentioned.

As to the proportions of the column we might also suppose these taken from the proportions of the human figure, and the leaves at the top to correspond to the hair. The introduction of caryatides and terms amongst the Greeks gives some plausibility at least to this conjecture; though I own I think it extends little farther than to the general proportions of columns, but not at all to the particular parts of the order.

The Ionic order ought only to be used in gay and slight buildings, as the meagreness of its capital never fills the eye sufficiently on the outside of a mass of solid architecture. I always thought this order designed for insides of houses and temples; but the universal practice to the contrary in all countries shows how much I stand single in this opinion. The false and distinctive prejudice in favour of lightness in buildings, I imagine, is the cause of this custom. I would only ask any man, if the buildings of the Egyptians, Greeks, or Romans had been light, according to modern ideas, whether we would have seen any remains of them in our day?

If a building were not so immensely great as to demand a variety of orders, I would omit entirely the two mongrel orders, the Composite and Tuscan; and, God knows, our confined ideas of magnificence in building do but too little require that variety. The Composite capital is by no means so fine as the Corinthian; and the Doric order can, without great variation, supply every purpose of the Tuscan.

These are my real sentiments with regard to the orders of our art. I shall be happy if any of these observations are worth your lordship's attention.

I flatter myself that the arts in general are in a progressive state in England. If the king builds a palace in a magnificent and pure style of architecture it will give a great push at once to the taste of this country; as it will not only furnish ideas for lesser buildings, but show effects both of external and internal composition, which this country as yet is entirely ignorant of. If it is done meanly, or in bad taste, I should apprehend the worst of consequences. Painting and sculpture depend more upon good architecture than one would imagine. They are the necessary accompaniments of the great style of architecture; and a building that makes no provision for them, and does not even demand them as necessary adjuncts, I would at once pronounce to be wretched.

My brother James writes with that love and enthusiasm of architecture which no one could feel that has not formed very extensive ideas of it. It is easy to tame and bring under proper management these large views; and the detail of our profession comes naturally to the man who understands its great principles, in the laws of beauty and grandeur; but the architect who begins with minutiæ will never rise above the race of those reptile artisans who have crawled about and infested this country for many years.

I have been twice in the country since I received your lordship's letter, and if I may judge by my own employment, private buildings go on apace. I expect to be very little in London all this summer, having business in various quarters of England, which I am with difficulty able to get managed with honour to myself and satisfaction to my employers.

I hope you will forgive the length of this epistle, and believe most respectfully, my lord, your lordship's most obedient and very faithful humble servant, ROBERT ADAM."

THE LAW OF LIGHT AND AIR.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

AT the ninth ordinary (business) meeting of this Institute for the present Session, held on Monday evening last, Mr. John Whichcord, President, in the chair, a letter was read from Mr. Norman Macleod, of the Science and Art Department, enclosing, by direction of the Lords of the Committee of Council on Education, a copy of an English abstract of the principal regulations for the proposed Exhibitions of Fine Arts in Madrid. Such exhibitions it is proposed to hold at intervals of three years in the month of April; and they will be open to Spanish and foreign artists alike.

Mr. T. Roger Smith, Fellow, brought forward the question of the pressure of the existing law of light and air upon architectural practitioners, and offered suggestions as to rendering the law less oppressive; also as to the part which the Royal Institute of British Architects might take in forming public opinion, and promoting legislation on the subject.* Mr. Roger Smith's observations and suggestions were comprised under the following heads:—

1. It may be fairly said that no one circumstance exerts so injurious a power, and is so great a hindrance to architecture in great towns, and especially in London, as the existing rights of light and air, and the manner in which they are enforced. As land grows more valuable, the natural result ought to be that builders should put more on to it,—in other words, should cover it with buildings of greater height than before; and this is a tendency to be encouraged alike on artistic and on commercial grounds. The loftier the building the more chance there is of making it architecturally effective, and the better will it enable a large number of business men to carry on their work within the limits of their own "market," or within easy reach of the great centres of business life, such, for example, as the Bank of England. But it is this tendency to carry buildings higher to which rights of light prove an obstacle. They not unfrequently render it impossible to raise a new structure, witness, especially in the streets of London, many a mutilated, unfinished, or truncated building, standing a melancholy and disfiguring wreck. They deter many persons from building. They add, often most unreasonably, to the cost of re-erecting buildings.

2. Two circumstances combine to make any interference by a building owner with his neighbour's rights to light and air peculiarly formidable: (*a*) The extent of such rights is always uncertain; it is difficult to ascertain in any given case what they really are; it is impossible to predict what the tribunals will declare them to be. (*b*) They are irresistible; they are habitually enforced by the most summary, formidable, and autocratic jurisdiction that obtains among us; and the man who can establish a right of light may make his own terms, or refuse to listen to any terms at all. It is probable that these two things, namely, the uncertainty, and the unassailable nature of the rights, hang together to a very large extent.

3. It is a matter of as great public necessity and advantage that cities should be improved as that their thoroughfares should be widened, their houses connected to drains, railways carried through them, their rookeries cleared of meaner dwellings, or sites for Board schools found in them. For each of these purposes Parliament has created powers which over-ride private rights, and in the exercise of which premises are constantly purchased compulsorily. In the case of railways, Parliament has entrusted powers of compulsory purchase to private trading companies. In the case of every London house, powers of taking down and rebuilding both its side walls, if they be party walls, are by statute granted to private individuals. If it be necessary, as is here contended, for the improvement of London and other great cities that some interference with the exercise of rights of light should be legalised, these precedents seem to support the proposal.

4. What is suggested is that (without destroying any existing methods of procedure, in cases where persons might refuse or omit to take advantage of the provisions of the proposed Act, and without confiscating any rights of light) it ought to be enacted that any man about to build on vacant land, or rebuild to a greater height than before, may acquire the right to do so, notwithstanding that he interferes with ancient lights, subject to two conditions—first, his giving due previous notice; second, his paying adequate compensation. It is also suggested that some provision should be made for, to some extent, defining, either by schedule or by means of rules to be framed by the judges or vice-chancellors, the rights that are possessed by the owners of ancient lights.

5. To carry out the first part of this proposal some such provision as the following should be made:—The building owner, who gives no notice of his intentions, should have no benefit from the Act; he who wishes to take advantage of it must, before beginning to build, notify his intention to go higher than before by advertisement, and by notice affixed to the building, and by deposit of plans in some neighbouring public place; for a definite period (probably about two months would suffice, but say three) he should acquire no right to go higher than before; if no protest is lodged, at the end of this time he is to have a right to carry out his deposited plan. Within the period of this notice any owner of a dominant tenement may lodge a protest, and such owner is to be at liberty in the protest to make a claim; if the building owner pays this claim he is to be at liberty to go on, so far as the rights of this tenement go, having compensated the owner; if he pays the amount into the Court of Chancery and causes a survey of the buildings to be made before any light is interfered with, he is also to be at liberty to go on, subject to the result of an inquiry; if he declines either of these courses, he is not to be at liberty to go on beyond the old height till an inquiry has been held and the compensation been assessed and paid; the mode of making such inquiries is a detail that need hardly be gone into, and probably it would best be subject to the direction of the Court of Chancery; the expenses should, of course, be borne by the building owner, and the usual ten per cent. for compulsory sale should be added. A measure based on these lines would, in the majority of cases, prevent buildings being delayed, and in all it would prevent their being mutilated. It would also tend towards securing that the compensations paid should be fair and not fancy prices, and incidentally would have this great advantage, that the majority of the inquiries would take place after the building has been completed, so that the measure of the damage actually done could be accurately taken, instead of resting only on the conflicting opinions of experts as to the results to be anticipated.

6. The rules for guiding those who hold inquiries under such an Act, or the positive definition of what constitutes a right of light, would be, after all, matters of less urgent moment when it was certain that a money compensation would be the worst that need come, instead of as now, an interim or perhaps a mandatory injunction; but it would, no doubt, be desirable, and perhaps possible, to lay down a few enactments, such, for example, as the famous but uncertain angle of forty-five degrees.

7. This appears peculiarly a subject for the Institute of Architects to promote. If it led the way, other public bodies might perhaps be induced to join it, and at any rate, by holding a conference or meeting,—if a public or semi-public one so much the better,—by circulating suggestions, or in various ways by ventilating the subject, it might form public opinion. It might in this way prevail upon some leading member of Parliament, or even the Government, to take up the subject, and were it to expend some of its funds in aiding to promote the introduction of a Bill drawn on the lines above suggested, they would certainly be devoted to promoting the public benefit and to removing what is now a formidable hindrance to the advancement of architecture.

Mr. Roger Smith concluded by moving the following resolution, which was seconded by E. C. Robins, F.S.A., Fellow, namely:—

"That the Council be requested to appoint a committee of members of the Institute to inquire into the question of the Law of Light and Air, as it affects buildings, and to make such practical suggestions with respect hereto as may seem expedient."

A discussion followed, in which Professor Kerr, Fellow; C. Locock Webb, Q.C., Hon.

* *Apropos* of this discussion, it may be of service to mention that we understand that a "Digest of the Law of Light," by Mr. E. S. Roscoe, barrister-at-law, will be published early next week. Our readers will many of them be familiar with Mr. Roscoe's "Digest of Building Cases," which was originally printed in this journal. The "Digest of the Law of Light" will be published by Messrs. Reeves & Turner, 100, Chancery-lane.

Associate; T. Chatfeild Clarke, Fellow; H. Dawson, Fellow; Arthur Cates, Member of Council; E. S. Roscoe, Hon. Associate; and the President, took part. The resolution was carried *nem. con.*

A VISIT TO A NEW BOARD SCHOOL.

ON Saturday afternoon last a number of the members of the Architectural Association visited a new school now approaching completion for the School Board for London, in almost the extreme north-west of the metropolis, viz., in Beethoven-street, a little to the north of the Queen's Park estate, Harrow-road,—a workmen's colony of small houses erected a few years ago by the Artisans', Labourers', and General Dwellings Company. Mr. E. R. Robson, architect to the Board, was present to receive the visitors, whom he conducted over the building, and courteously explained the details of the building, assisted by Mr. Coombes, of the Works Department of the Board, and Mr. Carpenter, clerk of works. As Mr. Robson pointed out, the building is distinguished by one or two salient features from most other Board Schools in London. In the first place, the site available was extensive enough to admit of making the whole of the school a ground-story erection, with the exception of some half-dozen small rooms provided for the private use of the teachers, these rooms being arranged, for the sake of economy and compactness of plan, over the hat and cloak rooms and lavatories used by the children. There are only two or three other schools which have been erected by the Board wholly on the ground story. The one now under notice affords some points of interest worth attention, especially by provincial architects and School Boards, on account of their being able, as a general rule, to spread their buildings over a comparatively large area of ground, and so to dispense with storied buildings. The school buildings which were visited on Saturday last are in two blocks, the larger one being intended to be used as a graded school on the "mixed" system, and the smaller one being for infants. In the principal block, the distinguishing feature of the plan is a large central hall, 65 ft. long by 30 ft. wide, and 34 ft. high from floor to ridge. This hall is top-lighted by a continuous skylight bordering the ridge, and by what may be called clearatory windows in the end gables above the roofs of class-rooms. Around this central hall are grouped six double class-rooms capable of being divided by central sliding partitions, partly of wood and partly of glass, into twelve single class-rooms, each of these single class-rooms being about 29 ft. long by 20 ft. wide. The floor of the class-rooms are on the same level as the floor of the hall, and provision is made, by means of wide openings fitted with revolving wooden shutters, of making the class-rooms at one end and one side of the central hall available for use as extra space for audiences on the occasion of lectures, meetings for presentation of prizes, &c. On occasions when it would be necessary to utilise the class-rooms in this way, the portable dais on which the lecturer would stand would be placed in the centre of one side of the hall, but, on ordinary occasions, when the audience would not be larger than could be seated in the hall itself, the speaker, lecturer, or teacher, would occupy the balcony or rostrum provided as a permanent part of the building at one end of the hall. In each of the class-rooms five rows of desks are provided, but the class-rooms being arranged round the central hall it has obviously been impossible to light all the rooms from the left-hand side. Left or right-hand lighting is, therefore, used, according to situation, supplemented by back lights as high up as possible. The school will be, as we have said, on the "mixed" system, that is to say, boys and girls will, in some of the classes, be taught together; some classes, however, will consist wholly of boys and others wholly of girls. Although this will be the case, the boys will be confined as much as possible to that portion of the building west of the central hall; on that side they will enter and leave the school, and on that side will be their hat and coat-rooms, latrines, lavatories, playgrounds, &c. The girls will enter the building from, and have their own playground and conveniences on, the eastern side of the building, and the infants' school will be located on the eastern side of the girls' playground. The infants' school consists of a gallery-room, 24 ft. by 20 ft., for *Kindergarten* teaching, and four class-rooms, each 38 ft. by 24 ft. The total number of children to be accommodated is 1,172, provision being made for 360 boys, 360 girls, and 452 infants. The builder is Mr. William Downs, of Hampton-street, Walworth-road, his general foreman being Mr. Stamp. The whole of the work is sound and good of its kind, although the Board has, with a view to economy, insisted on the building being kept as plain and as unpretentious as possible. We understand that the cost works out at about 9*l.* per head. The schools are warmed throughout with Boyd's hygiastic school-grates, the two large ones in the central hall being specially contrived for increased effectiveness. The locks and ironmongery have been supplied by Messrs. Hart, Son, Peard, & Co.; the revolving wooden shutters (before spoken of) by Messrs. Spencer Snoxell & Co., and the gasfitting has been done by Mr. Cannon. Ventilation is provided for by means of the window-sashes, by vertical tubes on the so-called "Tobin" principle, and by outlets in the ceiling. Referring to the tube-ventilators, Mr. Robson said he never knew them to cause draughts in any weather, so long as their sectional area bore a due proportion to the number of occupants in the apartment in which they were used. Mr. Robson explained that the advantage of the large central hall was that it admitted of flexibility in the working of the school. If a class, or two or three classes, had to be withdrawn for collective teaching on any subject, the hall was found to be very handy. It was also useful in taking the overflow of scholars when the school became crowded with children beyond the capacity for which it was built, and for instruction in drill during wet weather. We may add that the central hall in question resembles in the main the central hall at the High School for Girls at Blackheath, by the same architect, which was illustrated in the *Builder* about a year ago;* with the exceptions that the class-rooms are somewhat differently disposed around it, and that the hall and the class-rooms are, in the school visited on Saturday last, all on the same level.

SANITARY DISCUSSION.

IN the course of the proceedings at the Institute of Architects on the 21st ult., reported in our last, Mr. Chas. Forster Hayward read a portion of a paper on the ventilation of drains, and, proceeding to refer to the special difficulty of keeping them clear of grease, exhibited a small model which had just been made for him by Messrs. Doulton to illustrate a plan he suggested for the purpose. The speaker, however, was ruled out of order, as it had been suggested that the discussion on that occasion should be confined to questions of warming and ventilation rather than the other branches. Mr. Hayward, however, calls upon us to report him, because having long taken great practical interest in the subject which forces itself on every architect more or less, he had prepared a paper which he would have delivered the previous evening had he not been requested to postpone his remarks in favour of some distinguished visitors present.

The following are some of the heads of the paper. The special points to which he desired to call attention were the importance of public ventilation of drains in contradistinction to the host of private ventilating pipes now growing up everywhere, and so graphically referred to by Professor Lewis. The foul air should be drained away from the private houses (as much as foul water was) by the draught of the sewer created by furnaces and shafts, though this is not by any means a new suggestion. These furnaces might be the means of drawing away also and consuming the smoke from the flues of adjoining buildings, constructed so as to communicate with the same, while the heat evolved would generate power for electric lighting and other purposes. It was his belief that this was not only practicable, but likely before very long to come to pass. As regards ventilation of rooms and buildings, a system was noted which he had seen working automatically (and which—since then—had obtained the approval of the Congress at Exeter), so that on a certain heat being attained,— the apparatus being set to act at any given point of the thermometer,—a valve or grating could be opened for the admission of more fresh air, and the temperature regulated thereby, the apparatus acting also in the reverse way, to close the valve on the temperature being lowered to the required point. One might dilate on this at some length; but it was desirable to remember that after all, the great point in London was to take care what sort of air was admitted for ventilation; for, if that were not right, it mattered very little as to the means employed to admit it. The great mass of air in our London houses is drawn from the basement, and remembering this, one need not mention what abominations are often drawn up the staircase, with the heated air of the kitchen, &c., to pollute the comparatively pure ground and upper floor atmosphere. It was because of this that he was inclined to press the point of ventilation of sewers as of more importance even than the ventilation of rooms. With regard to the latter, however, he was in favour of Mr. Christian's views of natural ventilation, by opening windows in most cases, and in others by so-called Tobin's tubes, and Boyle's talc valve ventilators in extracting flues or shafts, preventing down-draught when not in action as up-shafts. In a large building (the Gymnasium) which the writer had built at Harrow, some shafts (somewhat similar to the Tobin system) had been fixed under the windows, with regulating doors and covers internally, so that at the cills, which were high up the walls, air was admitted as required. In other buildings at that place Watson's system had been employed with certain great disadvantages, viz., noise of wind and strong down-draught occasionally; but the simplest plan of all for school dormitories was the fixing of louvres over the door-heads, properly warming and ventilating the passages, and having plenty of window-space as well. No special mechanical system would suit schools generally, he was persuaded, unless where more than ordinary care could be given to it.

* Vol. xxxviii., pp. 415-417.

THE MONUMENT TO TITIAN, CADORE.

CADORE, in Upper Italy, has now become quite the rage among travellers. Tourists pure and simple "do" it; members of Alpine clubs revel in the mountain beauties of the neighbourhood; artists and writers illustrate and describe its lovely scenery. Even a novelist, Signor Caccianiga, has made it the stage of a charming novel, the "Roccolo di Sant' Alipio," the plot of which is laid in Cadore, and which treats of the stirring events of the, for Italians, memorable year 1848.

Among the inhabitants of this Alpine region, the memory of their great townsman, Titian, has always been held in very great veneration. We need scarcely tell our readers that Titian was born in Pieve di Cadore in the year 1477, and died there on the 27th of August, 1576, at the ripe old age of ninety-nine years, whilst engaged in painting his 600th picture. Thus came a glorious life to a glorious end, after seventy-two years of active and artistic labour, which finds no equal in the life of any other artist. Every one has heard how the proud and powerful Emperor Charles V. showed his esteem for the great artist. Whilst in the painter's studio, he picked up a brush which had fallen from the hands of the venerable painter, remarking, "Titian is worthy of the services of an emperor."

The desire of the inhabitants of Cadore to raise a monument to the memory of their great fellow citizen has now been fulfilled. A beautiful statue of Titian, modelled by Signor Dal Zotto, and cast in bronze by De Poli Brothers, of Vittorio, was solemnly unveiled at Pieve di Cadore on the 5th of September last.

The usual speeches which cannot be dispensed with on such occasions were not spared, nor were the customary illuminations, dinners, and other solemnities forgotten. Even a special publication, to commemorate the event, was brought out, under the title of "Cadore e Titiano," which, among many other interesting mementos of the artist, contained an autograph of this supereminently great painter.

Engravings in Mezzotinto. — The Burlington Fine Art Club are exhibiting in the gallery of the club, Savile-row, a collection illustrating the history of the art of engraving in mezzo-tinto down to the time of David Lucas. It consists of 198 works, includes specimens of the first known productions by Ludwig von Siegen, 1642, and is of rare interest. As is usual with the club, an excellent catalogue has been prepared.

NEW SYNAGOGUE, GARNET HILL, GLASGOW.

NEW SYNAGOGUE, GARNET-HILL, GLASGOW.

THE new building is situated at the south-west corner of Hill-street and Thistle-street. The main building stands east and west, the apse being towards the east, and facing Thistle-street. The dimensions are:—Length, 90 ft.; breadth, 53 ft. 6 in., exclusive of the space occupied by the apse, 25 ft. 6 in. by 11 ft.; and the entrance-hall, 29 ft. by 22 ft. 6 in. From the sloping nature of the ground a good basement-floor has been obtained, which, on the south side, is entirely above the ground. The accommodation provided on this floor consists of a hall, 42 ft. by 21 ft. 6 in.; two committee-rooms, each 28 ft. by 21 ft. 6 in.; a keeper's house, bath-room, lavatories, &c. Access to this floor is obtained at the Thistle-street level, as well as by a stair from the main entrance, which will be from Hill-street. The area of the building set apart for males will accommodate 312, the gallery, for ladies, 218, giving total of 530. The style of architecture adopted is Romanesque, with a Moresque feeling introduced in the detail and decorations.

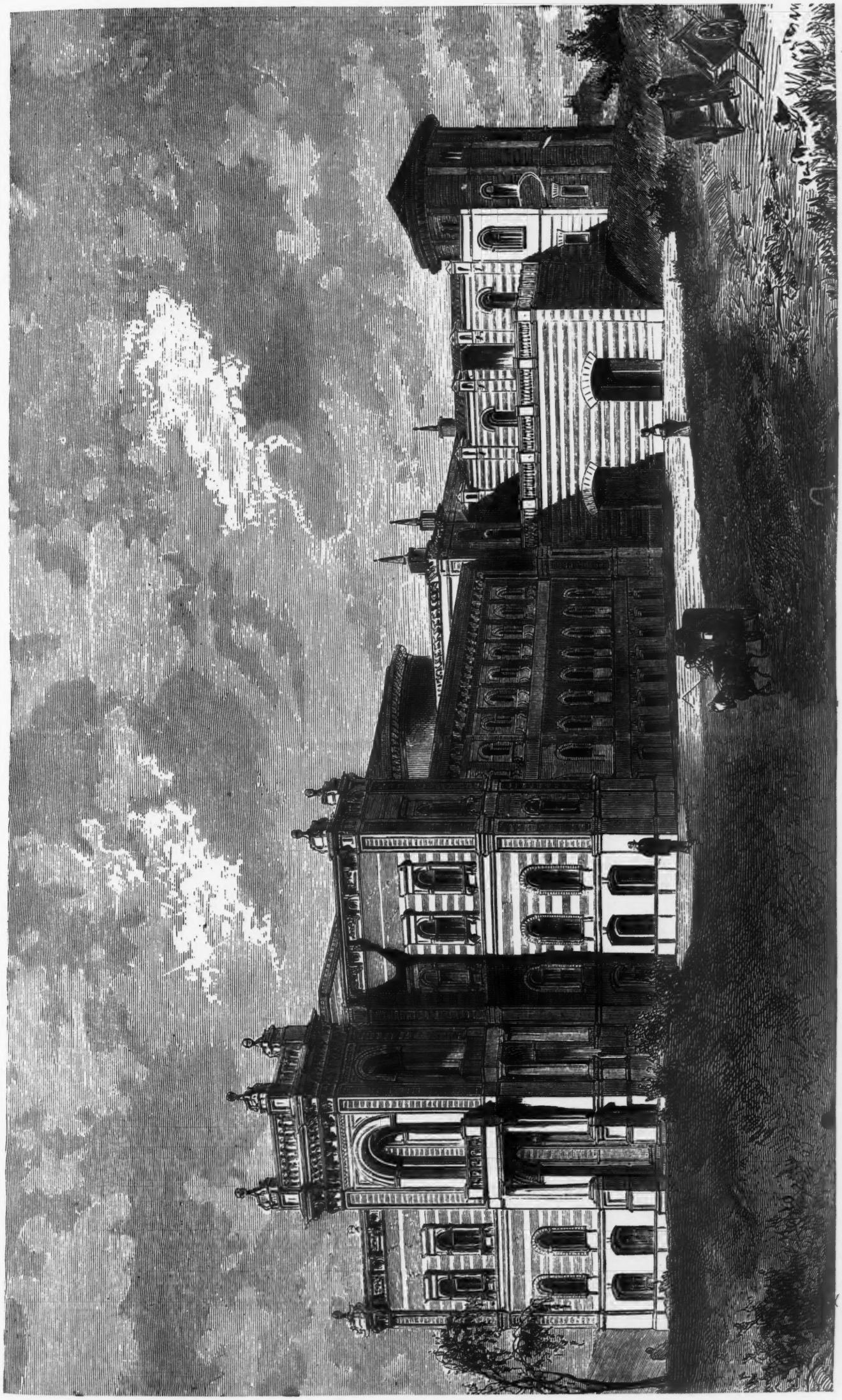
The principal entrance from Hill-street is a handsome doorway, 8 ft. wide with shafts on each side, having moulded and carved capitals. These shafts support a richly-moulded and carved arch, which contains a circular cusped window; each side of the entrance-gable is flanked by pinnacles. The entrance-hall is 25 ft. by 18 ft., lighted by two double-light windows; swing-doors lead to the main vestibule, which, including the space occupied by the main staircase, measures 49 ft. by 16 ft. Access to the area is obtained by swing-doors from the vestibule. The area is seated with rows of seats on both sides facing the centre, which part is unseated and partly occupied by the reader's desk and warden's pew. Each seat is divided off by arms, and a passage runs along the side walls by which easy and quiet access can be obtained to the seats. The apse is occupied by the ark, which is an important and ornamental feature in the building. A flight of five circular white marble steps leads up to the level where the ark stands. The interior dimensions of the building are:—Length, 69 ft.; width, 49 ft. 6 in.; height to the centre of the arched ceiling, 41 ft. The interior is divided longitudinally by octagonal pillars with ornamental caps, which support the ladies' gallery, and are carried up to support arches from the top of which springs the centre ceiling, which is in the form of an arch, and panelled. The apse has a circular roof divided into panels, which are filled with stained glass. The staircase at the end of the main vestibule, leading to the ladies' gallery, is handsomely finished, and consists of a centre flight, 6 ft. wide, and two side flights. A roomy landing, 16 ft. square, gives access by swing-doors to the gallery, which is arranged in the usual manner, but each seat is divided off by arms, as in the area. From the landing at the gallery a passage leads to a committee-room, 25 ft. by 18 ft., over the entrance-hall; there is also here a ladies' room, &c. The side windows are double-lights, those under the galleries having square heads and the upper ones circular. The staircase has a large three-light circular-headed window. The east end has two circular windows above the side galleries. All these windows are filled with stained glass, those in the staircase being highly ornamented. The woodwork of the interior is principally pitch-pine, except the reader's desk, which is in oak. The entrance-hall and vestibule are laid with tiles. The heating is effected by means of hot-water pipes, and the lighting by a handsome gaselier of sixty-five lights, and wall brackets. The whole interior of the building is painted and decorated in a handsome manner.

The total cost has been about 9,000*l.*, exclusive of the cost of the site.

The architect of the synagogue was Mr. John M'Leod, Hope-street, and the decorations were executed by Messrs. J. B. Bennet & Sons, Gordon-street.

NEW SYNAGOGUE, GARNET HILL, GLASGOW.—INTERIOR VIEW, LOOKING TOWARDS THE ARK.
MR. JOHN M'LEOD, ARCHITECT.

MONUMENT TO TITIAN, PIEVE DI CADORE, ITALY.—SIGNOR DAL ZOTTO, SCULPTOR.



THE NEW OBSERVATORY, VIENNA.—HERR F. FELLNER, ARCHITECT.

THE NEW OBSERVATORY, VIENNA.

THERE is an old saying that the best things are worst come by. It is undoubtedly true that it has required a great deal of labour and patience before Vienna could obtain an observatory worthy of the present state of practical astronomy and the city. But now that the work is finished, it may be affirmed with equal truth that the new observatory is one of the most important nurseries of observing scientific astronomy, both on account of its favourable position, its practical arrangement, and the valuable instruments with which it has been provided. The following short sketch of the previous history of the Vienna Observatory will show that its erection has for a long time been a great desideratum.

When, in 1753, under P. Josef Franz, the former observatory was established in the building formerly belonging to the University, and now turned over to the Imperial Academy of Sciences, it did not come up to the requirements of astronomy of that time, principally on account of its unfavourable position. The surrounding atmosphere, darkened by the smoke of innumerable chimneys, the constant vibrations caused by passing vehicles, and the frequent tollings of bells in the neighbouring Jesuits' Church, finally also the confined view circumscribed by surrounding church steeples, did not permit of certain important observations. Even for the correct geographical determination of its own position, which is one of the most elementary purposes of an observatory, it was found necessary, on account of the shortcomings mentioned, to improvise a field observatory on the Lauerberg, an eminence just outside Vienna.

As early as 1819, J. J. von Littrow, the father and predecessor in office of the present Astronomer of the Observatory, insisted upon the erection of a new observatory. Science, however, was at that time still treated Cinderella fashion, and thus the eminent astronomer mentioned only succeeded in effecting the re-building of the old observatory and the acquisition of new instruments. But the principal defects had not been remedied by those steps, and Director Carl von Littrow, on assuming office in 1842, had to earnestly resume the formerly vain efforts of his father. But he had to wait a long time for the realisation of his scheme, which he himself styled the "principal aim of his life," for only in 1868 Littrow was commissioned to select a site in the neighbourhood of Vienna for the erection of an observatory. After a long search, the most southern part of the so-called Türkenschanze (Turk's Redoubt), near Währing, appeared the most desirable spot.

Rising about 150 ft. above the city, and consequently higher than the atmosphere of Vienna, this locality possessed the recommendation, that its distance from the new university is not too great. The ground (of an area of 220,000 square feet) was purchased from the freeholder in 1872. In order to elaborate the plans for the new building, Professor Edmund Weiss, Assistant Observer of the Vienna Observatory, went in the summer of 1872 to England and America to inquire into the working of the principal observatories there, and to visit the optical establishments of repute of those countries. The information collected with indefatigable zeal by Professor Weiss soon led to plans for the new observatory being drawn up, the execution of which was confided to Herr F. Fellner, the architect of the Vienna Stadtheater. The first sod was turned in March, 1874, and the new establishment, provided with some of the newest instruments, was opened in 1877.

The building is cruciform, a residence being adjoined to the longer member of the cross. The front (southern) of the building, represented in the illustration which we give, contains the residences of the director, of Professor Weiss, and of the assistants, the lecture-hall, library, and offices. The observatory proper has as its centre a dome 42 ft. in diameter. This will contain the largest telescope of the establishment. This telescope is the work of Howard Grubb, of Dublin, cost about 10,000*l.*, and has an opening of 2 ft. 3 in. and a focus of 32 ft. The cupola, which permits of an uninterrupted view on all sides, is surrounded by a large room, containing the movable instruments of the observatory. The terraces running round this part of the building permit of observations being taken in the open air towards all points of the compass. To the east, north, and west of the principal dome, are wings for the meridional instruments. Each of those wings ends in a smaller dome with a diameter of 21 ft. Two of those domes contain also refractors for current observations, the largest of which has an opening of 1 ft. and a focus of 16 ft., and was made by Clark, of Boston, at a cost of 1,200*l.* The northern dome, not seen in our illustration, contains the photographic and spectroscopic apparatus. All the establishments which have supplied the Vienna observatory with its instruments were visited by Herr Weiss.

Notwithstanding the disadvantages under which its staff had to labour, the old Vienna observatory was well known for the value of its observations; and it is therefore fully expected that the new establishment, provided with all the apparatus indispensable for an observatory of the first order, will soon take rank with those of Greenwich, Cambridge, Pultowa, and others of like eminence.*

* According to the *Annuaire* of the Brussels Observatory for 1881, there are at present 118 public astronomical observatories in full activity, viz.,—84 in Europe, 2 in Asia, 2 in Africa, 3 in Oceania, and 27 in the two Americas. The United States alone have 19, Mexico has 2, Brazil, Chili, Columbia, Ecuador, the Argentine Republic, and New Britain, one each. In Europe, Prussia is the state which has most public observatories; it has 29; next come England and Russia, which have respectively 14 and 12; then Italy, which has 9, Austria 8, France 6, Switzerland 4, Sweden 3, Holland, Norway, Spain, and Portugal, 2 each; lastly, Belgium, Greece, and Denmark. The oldest observatory in operation at present is that of Leyden, founded in 1632; it has thus existed nearly two centuries and a half. That of Copenhagen was instituted a few years later: it dates from 1637. Forty years after, the observatory of Paris was founded, and in 1675 that of Greenwich. Of observatories founded in the eighteenth century, 41 still exist; 3 were founded between 1700 and 1725, 6 between 1725 and 1750, 19 between 1750 and 1775, and 13 between 1775 and 1800. Of those instituted during the present century, 19 date from between 1800 and 1825, 17 from 1825 to 1850, 39 from 1850 to 1880. The observatories of Italy date from the second half of the eighteenth century. In Russia the oldest observatory, that of Moscow, was founded in 1760, those of Warsaw and Wilna date from 1714, the nine others being instituted in the present century. In Germany the oldest observatory is that of Berlin (1705). Four new observatories have been erected within the last two years. In France, after that of Paris, which dates from 1667, the oldest observatories are those of Marseilles (1702) and Toulouse (1775). Those of Meudon, Lyons, and Montsouris are recent. The oldest observatory of the New World is that of Rio Janeiro, founded in 1780. After it the oldest is that of Chicago (1832). The other observatories of America have been constructed in the second half of this century. In America, since 1870, six observatories of the best construction and equipped with the most perfect instruments have been established.

THE RECTANGULAR KEEP OF A NORMAN CASTLE.

WHAT is known as the Norman style of architecture prevailed in England from the Conquest to the close of the reign of Stephen,—that is, from 1066 to 1154; but this latter is necessarily an arbitrary date, since it was by degrees only that one style of architecture passed into another, and the Norman features, though found in all buildings, and especially in castles, down to the end of the reign of Henry II., or 1189, became more and more mixed up with those of the succeeding style.

The castles of the eleventh and twelfth centuries, whether in Normandy or in England, were of two distinct types,—those with the rectangular and those with the shell keep. The former were almost always employed when the site selected was a new one, the latter where the site was old, and where there existed a "motte" or mound. There are exceptions to this,—that is to say, the rectangular keep is occasionally found on an old site, but the shell keep is never found on a new one. The distinction was mainly due to the fact that the massive heavy tower could only be safely founded upon solid ground, whereas the lighter and more widely distributed weight of the shell keep was better suited to that which was artificial. The shell type was probably the most numerous of the two; but the tower type, being of a more solid and more durable character, has lasted longest, and is at this time so much the most common, that it has been designated by writers of authority as the type, instead of as but one of the two types of a Norman keep. The rectangular and the shell keep never occur in the same castle; and, as a rule, where there is a mound there is no rectangular keep. The only known exceptions to this rule are at Christchurch, Guildford, Clun, Saffron Walden, and Bramber. At Christchurch the mound is low, and the keep walls seem to be carried through it to the solid ground. At Guildford, as at Clun, where the mound is large, the keep is built on its slope, so that the lower end and one-third of the contiguous sides are seen to rest on the solid ground, and thus effectually counteract the tendency of the upper part to slide down. Walden has not been carefully examined. At Bramber there is an oblong natural hill, surrounded by a very deep ditch, in part artificial, while at one end of the hill is a square keep, and near the other end a small mound. At Llwchwr, in South Wales, a small square tower stands upon a low and ill-defined mound, mixed up with the bank of a Roman camp. The tower, indeed, is not actually Norman, though no doubt early, and it most probably descends to the natural ground. The large rectangular tower at Oxford is not the keep, but a mural tower, though of unusual bulk. The keep there was a shell, and crowned the mound. At Kenilworth there seems to have been a small mound, which has been included within the keep, the walls of which rest upon the natural rock. The mound in this way fills up the basement of the keep, the ground-floor of which is thus raised 12 ft. to 15 ft. above the exterior level, as in the shell keep of Berkeley, and in some degree at Pontefract.

The rectangular keep is, of all military structures, the simplest in form, the grandest in outline and dimensions, the sternest in passive strength, the most durable in design and workmanship, and in most cases by some years the earliest in date. Of the five great fortresses which covered the road from Dover to London, Dover itself, Canterbury, Rochester, and London have square keeps; the fifth, Tonbridge, having an earlier mound, has a shell-keep. Farnham and Berkhampstead, Windsor, Wallingford, and Oxford,—fortresses guarding London from the west,—having mounds, have not square keeps. Hedingham and Colchester to the east, having square keeps, are without the mound, though Hedingham, like Corfe and Bramber, stands on a natural hill. Northwards, Warwick and Kenilworth confirm the rule, one having had a mound and no square keep; the other a square keep which has absorbed the mound, if mound there was. At Belvoir, the mound, a natural hill, is capped by a shell, as were the artificial mounds of Bedford, Cambridge, Clare, Eye, and Ongar, while rectangular keeps are, or were, found at Chepstow, Ludlow, Bristol, and Wattlesborough, Lancaster and Newcastle, and on the moundless sites of Bamborough, Carlisle, Corfe, Norham, Norwich, Nottingham, Porchester, Scarborough, Knaresborough, Helmsley, and Richmond, and in the less distinguished lordships, some of Norman foundation, of Appleby, Brough, Brougham, Bowes, Castle Rising, Clitheroe, Castleton, Goderich, and Prudhoe. Where there is a rectangular keep it rises high over every part of the fortress, and gives, as at Bamborough, unity and grandeur to the architectural composition. It is usually, as at Rochester, Dover, Richmond, and Scarborough, placed upon the highest ground within the enclosure, and very rarely indeed in or near the centre, although, as in London, it may have been rendered central by the removal of its original *enceinte* and the substitution of new and extended lines. At Malling, perhaps the earliest in England of these keeps, and at Helmsley and Scarborough, probably the two latest,—for that of Knaresborough, though square, is of Decorated date,—the keep stands on one side of, and forms a part of the *enceinte*. At Bamborough, Bramber, Canterbury, Carlisle, Clitheroe, and Rochester, the keep stands clear of, but very near to, the outer wall, of which, at Porchester, it forms one angle. At Kenilworth and Bridgnorth the keep forms an angle of the inner wall; at Norham, one face ranges with the outer and one with the inner wall; and at Ludlow and Ogmore the keep is placed on the inner wall, close to the main gateway. Dover stands detached in the middle of what appears to be its original enclosure, and so, probably, did Hedingham and Castle Rising. At Mitford, near Morpeth, is a singular example of a rectangular keep, of which three angles are right-angled, and the fourth face is broken into two planes meeting at a low salient. It is probably late in the period.

These keeps vary in dimensions from 25 ft. to 80 ft. and even 100 ft. in the side, and they are usually from one and half to two diameters in height to the base of the parapet. Many have been raised a stage, as Porchester, Bridgnorth, Richmond, Brough, Brougham, Kenilworth, and Norham. In most of these cases the addition was made within the Norman period, and possibly contemporaneous with the substitution of a covering of lead for one of shingles or stone tiles.

Usually the flat exterior faces are relieved by

broad pilaster strips of slight projection, from 5 ft. to 10 ft. wide, by 6 in. in depth, one at the end of and flanking each face, and in the larger keeps one, or even two, between them. The flanking pilasters are commonly placed so as to cover the angle, the two meeting; sometimes, however, they do not quite meet, and the solid angle is replaced by a hollow nook, occasionally, in late keeps, as at Castle Rising and Scarborough, occupied by a bold bead or engaged shaft. In all but the very small keeps, these flanking pilasters are continued 8 ft. to 10 ft. clear above the parapet as the outer faces of square turrets, now usually ruined. At Hedingham one, partly perfect, remains. Those on the White tower and at Rochester are in part original, and certainly represent very closely original structures. At Bowes there seems to have been but one turret, covering the stair-head. The intermediate pilasters usually stop either just below the base of the parapet, or below an upper window. At Dover they are carried into the parapet and support slight internal recesses there, but this is very rare. The pilasters usually are divided by strings into stages, marking the levels of the different floors, and all rise from a common plinth, sometimes slight; but sometimes, as at Malling, Kenilworth, Guildford, and Norham, where one side rises from lower ground, the plinth is 8 ft. to 10 ft. high, and has at Kenilworth and Norham a very bold base. The set-off and string-course are sometimes carried along both wall and pilasters. At Colchester one corner of the keep is rounded, and carries a well-stair; at the White Tower a similar half-round forms the apse of the chapel, and the pilasters appear upon it; at Rochester the rounded corner is solid, save at one story, but this is probably due to a reconstruction. The pilasters are one of the most marked features of the Norman style, and their presence at once distinguishes a keep of that period from the fine fourteenth-century towers, as Borthwick and Lochleven, found in Scotland, as well as from towers of Early English date, where the pilasters are bolder and narrower, and often, as at Exeter Castle, chamfered at the angles.

The keep wall is from 7 ft. to 14 ft. thick, and at the base sometimes 20 ft. That of Colchester is reputed to be 30 ft. That of the Tower of London is said to have taken six weeks to pierce, with all modern tools and appliances. The lower 14 ft. of the keep of Newcastle is thought to be solid. The wall usually diminishes in thickness as it rises, sometimes by external sets-off of 6 in., more commonly by an internal step of 1 ft. at each floor level. Occasionally the exterior face slopes inward or batters, but this is unusual. The summit at the level of the allure or battlement walk is seldom less than 6 ft., and often 7 ft. or 8 ft. thick. Within, the larger keeps are divided by a cross wall ascending to the summit, and usually pierced in each floor. Sometimes this wall is confined to the basement and first floor. Kenilworth, a large keep, had no cross wall; Norwich, Colchester, and Canterbury had two, and some have chambers walled off at the ends by secondary cross walls, as Castle Rising and Wolvesey. At Bowes two walls divided the basement into three chambers. Usually these dividing walls were pierced by doorways, but the openings in the main floor were larger. At Scarborough was, and at Hedingham still is, a single large arch; at Rochester and at Middleham are several arches. Where there is no cross wall its place was, no doubt, supplied by posts of timber. The smaller keeps have a basement and a first floor; the larger, a second and third floor,—the latter being often an early addition.

The basement chamber is almost always at the exterior ground level, and never much below it; it is commonly from 12 ft. to 15 ft. high, lighted, or rather aired, by one or more narrow loops in each face, splayed and stepped up to within: Richmond has not even these,—the basement was evidently always a store-room. Now and then, but not often, its walls contain chambers: more commonly they are solid. In small keeps, as Ludlow and Carlisle, the first was the main floor, or room of state; in the larger, as Rochester, it seems to have been a barrack. The apertures were rather larger than those below, but not much. In the walls were commonly chambers. In the large keeps the main floor, usually the second, was from 25 ft. to 30 ft. high, generally with windows 2 ft. or so broad, and often coupled under a single arch outside. Inside, the recess was splayed, and sometimes descended to the floor level, while in the jambs were door-openings into mural chambers. Some of the castle halls must have been noble rooms. Where there was a cross wall, as at Rochester, Norham, and Middleham, there were two rooms, at Kenilworth only one, unless, indeed, the open space was subdivided by a brattice. Usually, in the larger castles, the wall of the main floor is pierced, high up, by a sort of triforium gallery, into which the outer windows open, and which opens into the chamber by lofty and larger arches of 3 ft. to 4 ft. opening. Possibly these galleries and their windows were intended to give another line of defence; but they must have destroyed the privacy of the hall and made it very cold. Above the main floor was an upper floor, probably occupied as private rooms, bratticed off by partitions of wood. Where this floor was not a part of the original building, to gain it seems to have been one object of the addition. It was placed immediately below the roof. The original roof seems to have been open, at a moderate pitch, such as was necessary to carry off the water from a covering of shingles. The gables did not rise above the parapet, so that there was thus a great loss of space. In the smaller keeps the roof was a simple ridge with lateral gutters; where there was a cross wall the roof was double, with a central as well as lateral gutters. That this was the usual arrangement is clear from the old weather mouldings, which remain in the end walls wherever these have been raised. The original roof having its ridge rather below the parapet, had its side gutters in deep hollows. Of course, no military engine could have been placed on such a roof. Where the walls have been raised the roof has been replaced by a floor, and an upper story introduced with either a flat, or nearly flat, and leaded roof. These additions are almost always late Norman; but at Brougham they are Decorated. At Ludlow, where there was a central ridge with two lateral gutters, the interior has been re-arranged, and a flat roof laid at the ridge level of the old one, gaining a floor without raising the walls. The gables never seem, as in the Scottish towers, to have risen above the parapet. Probably one reason why the Norman roofs were lifted and flattened was to allow of military engines being placed upon them, and the use of lead must have come in rather suddenly just before the close of the Norman period.

The floors of these keeps are almost always of timber; thick rough planks, resting upon stout balks 12 in. or 14 in. square, placed about 2 ft. or 3 ft. apart, and resting either on a ledge or in regular joist-holes. Such floors exposed the keep to be burnt, and once well on fire it would certainly burn till it was gutted. The basement is now and then vaulted, but the vaulting is very rarely original, and when it is so the keep is late. The vaulting at the Tower and at Dover is modern brickwork; the Ludlow vault seems Early English; that at the lower part of Carlisle, that of Porchester, Brougham, Bowes, and Richmond, Decorated; the vaulting at Middleham, Newcastle, and Mitford may be original. The vaulting at Norham, a late keep, may be original, but was more probably inserted at an early period by Bishop Puiset. That of Bamborough is an insertion. The basement of Bowes was vaulted, but what remains of one rib is either Decorated or later. In a few examples where guns have been mounted on a Norman keep, a brick vault has been sprung over the upper chamber, and the roof filled up and paved. At Dover, Carlisle, and Newcastle, where this has been done, the upper openings of the hall are closed, and the interior of the fabric utterly disfigured. There is certainly no original vaulting of a great chamber higher than the basement.

In most keeps there is a well-stair in one angle, which commences at the ground-level, supplies every floor, and terminates on the roof under the turret-head, but has no communication below with the exterior. This was so originally at the White Tower. There are also other staircases at other levels, beginning on the first, or even the second, floor, and not always reaching the roof. As a rule, one stair, descending to the storeroom, seems to have been enough; but it was thought an advantage to have two or three ascending from the hall or upper floor to the ramparts, for readiness during a siege. At Canterbury there are also two well-staircases in the side walls; and there is one in London. These well-staircases are from 8 ft. to 12 ft. diameter, and lighted with loops. Usually they communicate with each floor through a sort of lobby. The stairs are always of stone. As the steps at each angle do not suit the same level of the mural gallery, these latter are coaxed and accommodated usually very clumsily. Now and then the arrangement is different, the stair stops at the first floor, and is continued at the opposite diagonal. Sometimes, as at Carlisle, Ludlow, and Bamborough, where the outer door is at the ground-level, the staircase commences in the side of the doorway, and ascends straight in the wall, and, on reaching the next angle proceeds as a well-stair. This is so at Chepstow, where the upper ascent is probably an addition. At Carlisle and Ludlow the staircase stops at the first floor, and is continued at another angle. At Brough, where the outer door is on the first floor, a narrow straight stair rises in the wall to the second. At Prudhoe, it is continued round two sides, and at Richmond. The direction of the staircases may be always detected by the position of the exterior loops, and the general rule seems to be to limit the approach to the stores and main floor, and from the latter to give a free access to the ramparts. The curves and angles in those narrow staircases facilitated the defence of them.

The immense thickness of the walls is usually taken advantage of for the formation of mural chambers. These are rectangular, and sometimes placed in an angle, and L-shaped. They are vaulted, usually in a plain barrel, or equally plain groining, lighted by external loops, and now and then, though very rarely, have, as at Bowes, a fireplace. In breadth, they vary from 4 ft. to 6 ft., and they are of all lengths. Usually they are more abundant and larger in the main and upper floors. They were intended for sleeping-rooms, garderobes, oratories, and well-chambers. At Guildford is a very remarkable oratory, at the first-floor level, L-shaped, with a mural arcade. At Brougham the oratory is on the upper floor. At Rochester and Dover the upper gallery does not run all round; and in the latter ends in a prison cell. Some keeps, even with thick walls, contain but few chambers. The two remaining sides of Norham, a late keep, have none, or, at most, one. Dover, also late, is honeycombed with chambers at every level, and even the cross-wall above is threaded by a gallery. Newcastle, built in 1080, has very many chambers. Where there are garderobes they have stone seats, and the vent is usually a vertical shaft in the wall, though sometimes there is a shoot upon the exterior surface of it, or, though more rarely, it is corbelled out. At Kenilworth, a fine but late keep, one angle contained a well-stair, and the three others chambers. They are turrets from the ground, and in size larger than usual. They are floored with timber. One angle turret seems to have been wholly occupied by garderobes, and the lower part, at present filled with light soil, was evidently a large cesspool. At Corfe a very large garderobe tower,—perhaps a Norman addition,—is appended to one side of the keep.

Most keeps, even early ones, contain fireplaces. One has been discovered in the Tower, long supposed to be without them. At Dover they are in the cross wall; at Rochester, where they are very handsome, in the sides. Usually the funnel ascends in the wall; at Rochester and Colchester it forks, and the two flues open a little way up on the face of the wall, concealed in the hollow angle of a pilaster. It is not easy to tell whether a flue is original when the fittings of the fireplace have been inserted; thus, in the Tower closets, where the fireplaces are Tudor, there are no marks in the wall as though it had been cut into to construct a flue, so these may represent original fireplaces, though this is not probable. No doubt open hearths were much used, and fireplaces of iron with flues of wood and plaster, which would leave no trace when removed. The fireplaces in the mural chambers at Dover seem all to be of Tudor date. No fireplace has been discovered in Richmond keep; there is an original one in a mural chamber at Bowes.

These keeps, built mainly for security, have but few external openings, and these rarely of any size. Sometimes the narrowest part of the loop is in the centre of the wall, with a splay each way, having the section of an hour-glass. This is seen at Kenilworth and Porchester, late keeps. The arrangement seems a bad one, much aiding the entrance of an arrow. The larger windows, sometimes of 3 ft. or 4 ft. opening, were closed with shutters.

A well was an important accessory to a Norman keep. In Dover there are two,—one being in the forebuilding. Sometimes, as at Bamborough, Castle Rising, and Bungay, its mouth is at the ground level. More frequently its pipe is contained within the wall and opens into a

special well-chamber, as at Dover, Newcastle, and Kenilworth. At Carlisle it is in the wall, and was reached by an internal lateral opening, now converted into an exterior one. At Rochester it is in the cross wall; the pipe there ascends to the summit, and has an opening at each floor, and there are traces of some such arrangement at Canterbury. At Porchester the well occupies one angle of the wall, and opens on each floor. At Colchester the well has been long closed. At Hedingham there is known to be a well, but its place is lost. Bamborough, one of the most remarkable wells in the country, carried down 145 ft. in whin rock, was only discovered in the last century. At Richmond a hollow octagonal pier, carrying the vault, has been built exactly over the well, which is reached through it. At Arques, in Normandy, where the well is near one angle, a pipe has been built over it, raising the mouth to the first-floor. At Bowes, Brough, Brougham, Guildford, Castleton, and Corfe, no well has been discovered.

Great pains were usually taken to cover the entrances of these keeps by a Forebuilding, the details of which have been but little studied. Upon one side of the keep, a part of its structure, was placed a smaller tower, also rectangular, of the length,—that is, covering one side,—and about one-third of the breadth of the keep, and two-thirds of its height. At one end, at the ground level, commenced a straight staircase, which rose to near the other end, when it stopped at a landing, which was the vestibule of the actual entrance to the keep. Above the lowest part of the staircase was a low tower and a strong doorway. Half-way up the staircase was often a second door-way, and sometimes as at Dover, a second tower. Over the landing at the stair-head was a large and taller tower, also with a strong doorway. Outside this doorway the staircase was often broken by a drawbridge, as at Rochester. The staircase was not always covered over, but was protected by an exterior parapet of some height, as at Berkeley, where the shell keep has a forebuilding, a very unusual example. The battlements of the lower or entrance-tower were reached by a little door in the adjacent angle of the keep high up. This is seen at Middleham, Rochester, and Brougham, where the tower itself is removed. In the keep-wall, by the side of the staircase, was often a recess for the guard, as at Middleham. The bridge pit had an exterior parapet, concealing those who used the bridge. At Castle Rising, where the middle gate is perfect, its battlements are reached by a small door from the keep.

The vestibule at the stair-head was usually a good-sized chamber, often vaulted. In it was the main doorway of the keep, of not less than 6 ft. opening, with flanking shafts and moulded architrave. At Castle Rising this ante-chamber is arcaded, and very handsome; at Rochester it is plain, or nearly so. At Dover it contains a guard-chamber, at Newcastle and at Middleham a chapel. The basement below the vestibule was usually a prison, and had a small door into the corresponding basement of the keep. At Rochester are two floors below the vestibule and two above it. The forebuilding is perfect only at Castle Rising, Norwich, Dover, and Newcastle; there are large remains of it at Rochester, Porchester, and Middleham, and some at Hedingham, Corfe, and Kenilworth. At Scarborough, Brougham, Bramber, Canterbury, and Helmsley there are traces only. At Dover there are vaults below the staircase and lower tower, above which is a vestibule and a chapel, and in the first or upper floor a second chapel. Sometimes there is a way from the foot of the staircase of the forebuilding into the basement of the keep, but probably this is not original. It is seen at Dover, Newcastle, and Castle Rising. The White Tower has been so pulled about that it is difficult to say how it was originally entered, but probably by a forebuilding on the south face. The forebuilding is essentially a Norman appendage, and, with the exception of Berkeley, and, perhaps, Chilham and Oxford, confined to those of the rectangular pattern. It has been supposed to mark a late keep, but there is a forebuilding at Arques, usually regarded as a very early one.

In the smaller keeps, and some few of the larger ones, there is no forebuilding, and the entrance is by a plain arch, as at Clitheroe, Goderich, Bowes, Guildford, and Malling. This entrance was on the first floor. In the latter case it is, indeed, in the basement, but nevertheless 10 ft. above the ground level. The approach in these cases seems to have been by an external staircase of timber. At Chepstow, Carlisle, Bamborough, and Ludlow the entrance was by a single doorway at the ground level. In almost all the larger keeps it has been found convenient,—probably when they ceased to be used solely as military buildings,—to have a large direct entrance at the ground level. Such have been made at London, Rochester, Norham, Kenilworth, Porchester, Guildford, Clitherhoe, Hedingham, Colchester, Goderich, Canterbury, Brough, and Malling. Some of these are evidently insertions, taking the place of a loop; others seem to have been original doors opening from the basement of the keep into that of the forebuilding, made external on its destruction, as at Corfe, and, perhaps, Kenilworth. At Richmond the removal of the forebuilding has laid open a large Norman arch in the basement, which opened into it. Besides these main doors, Ludlow has two doors opening from the keep upon the ramparts of the curtain; and at Rochester is a small door, whence probably a plank drawbridge, 6 ft. or 8 ft. long, dropped upon the adjacent curtain. There is something like this at Helmsley, and in the Norman keep of Adare, in Ireland.

Most keeps contain an oratory; some a regular chapel. Dover is peculiar in having two, both in the forebuilding, in its lower tower. Newcastle has one in its forebuilding, under the staircase and upper tower. Middleham has the remains of a very handsome one at the head of the outer staircase. At Rochester the chapel seems to have been in the forebuilding, high up, beneath the kitchen. At Castle Rising it is on the first floor of the keep, at one end of one of the large rooms. At Guildford and Brougham it was in the wall. The finest and earliest castle-chapel in England is that in the White Tower. It is large, has a nave, aisles, and semicircular apse, all vaulted. This chapel occupies two stories, and below it are two floors of vaulted crypts, intended for prisons.

The kitchen, though, of course, a necessary appendage to a keep, is not often to be discovered. Probably the cooking was of a rude character, mostly carried on before an open fire, or by boiling, or broiling over a brasier. There is a kitchen in the forebuilding at Rochester, high up; and one at the first-floor level, in a mural chamber, at Castle Rising, and at Norwich. The kitchen, when it was a distinct chamber, was at the level of the hall, or even above it.

The defences of the outer doorway in a Norman keep were usually one or two stout doors of oak, strengthened with iron, and held close by one or two bars, also of oak, which ran back into deep holes in the wall, about 4 in. square. The portcullis, used in other parts of the castle, was rare in the keep. It is a very old method of defence, formed of stone in the Great Pyramid, and the groove for which remains in the city gate of Pompeii. When used, as in the keeps of Scarborough, Hedingham, and Rochester, it was a single grate, probably of oak spiked and plated with iron, and it was worked from a mural chamber over the archway. Sometimes, from the narrow dimensions of the groove, the grate seems to have been wholly of iron. It was worked by chains or cords wrapped round a cylinder or windlass, such as is still in use in the main gate-house of the Tower. Norman keeps very seldom retain their original parapets or turrets, The parapet was about 2 ft. thick and 5 ft. high. It was either plain or had broad merlons and narrow embrasures. Usually the parapet was a mere continuation of the wall, without corbels or any contrivance to widen the rampart walls, which were of sufficient thickness for the walk. At Rochester holes are seen at the base of the parapet for beams to carry a bretasche or external gallery, but these probably are not original. The angle turrets are usually mere places of arms, the rampart walk passing through them. Sometimes they have an upper floor reached by a stone stair or ladder.

Much has been said of Norman dungeons, oubliettes, and subterranean vaults, damp and wretched, appliances of Norman tyranny. So far as these keeps are concerned in the matter, they never contain underground chambers of any kind. The basement floor is usually at the ground level, or at most 2 ft. or 3 ft. below it. Where the keep is built on rising ground, it may happen that a chamber, the door of which is at the ground level, may have one wall half buried beneath the soil, but there is nothing beyond this. Prisoners of the common sort were not shut up in the keep, space there was too valuable. The basement could scarce have been used as a prison where it contained the castle well, and the mural chambers usually are barred inside. The rooms under the vestibule, and some of the lower vaults, and the crypts in the Tower of London, probably were so used. In the upper gallery at Dover there is a very evident prison. At Carlisle, where the basement has recently been used as a prison, it probably was not one originally. Large as some of the keeps were, they were not calculated to be held against a long siege or a blockade, and all the spare room would then be needed for provisions and stores. The earlier keeps are very plain. The Tower has not even a moulding save in the chapel, and an exterior blocking over its main tier of windows. No doubt it has been much mutilated, but, had the ornaments been cut off, the courses of freestone that carried them would still be distinguishable from the ordinary rubble masonry. Some of the later keeps exhibit rather rich details, though usually marked by much simplicity, about the doors, windows, and fireplaces. Such is the case at Rochester, Hedingham, Dover, and Newcastle, and specially at Castle Rising, one of the most highly-ornamented of keeps. Bamborough has a fine doorway early in the twelfth century; Ludlow and Guildford some arcades; Porchester some good windows. The exterior of Norwich is rudely panelled in tiers of arches. Goderich, otherwise very plain, has an exterior string of hatched or chevron work. In these keeps the arches are usually full-centred, but sometimes segmental, and where flat there is commonly above the lintel a relieving arch with a recessed tympanum, as at Chepstow. At Malling, though there are no mouldings, the first-floor window on one side is the centre of five deep plain full-centred niches in the exterior face, which cannot have been meant for use, and in another face, also outside, are five other niches, all unpierced. Occasionally false arches are turned in the walls, as though a door had been closed up, or the possibility of a new opening provided for. Such are seen at Dover, Norwich, and Guildford. They are thought, but scarcely on good grounds, to be intended to invite an attack where the wall is specially thick.

One or two keeps have buttresses of bold projection, greatly in contrast to the usual flat pilaster. This is so at Colchester and Arques, where the exterior stair passes through one of them. At Arques, also, these buttresses are turned to account in the upper story, arches being thrown across from buttress to buttress, upon which are built chambers, and on one face a chapel, through the floor of which missiles could be dropped upon the assailants below. Arques, unfortunately, is built of chalk and flint, with little or no original ashlar, and it is, in consequence, impracticable to decide between what is original and what has been added.

Norman keeps differ in workmanship as in material. The White Tower, built in great haste, is of rubble, rudely coursed, with very open joints; but the plinth, quoins, and pilasters seem to have been of Kentish rag, dressed as ashlar, and also open jointed. Malling is an excellent example of very early Norman rubble, with open joints, and this may also be said of the basement of the adjacent abbey church, and perhaps of the tower of the parish church. Guildford contains a good deal of herring-bone work, Chepstow and Penllyne a little. Colchester is partly built of old Roman materials, chiefly brick. In the chalk districts flint was largely used, as at Bramber, Dover, Hastings, Canterbury, Churnham, Berkhamsted, and Walden. In the South, or near the sea, the ashlar is often in small blocks from Caen. Corfe is of excellent local ashlar, as is most of Kenilworth. Porchester is of chalk and flint rubble, faced with ashlar outside and partially inside. Hedingham is all ashlar, and altogether the finest keep in England. Bowes is a fine example of ashlar, in a local stone. Norman masonry is always sound, though often rough, and is very durable. Now and then chain-courses of timber are inserted in the heart of the walls, to hold the work together till the mortar shall set, and it has happened that the wall has been breached and the exposed timbers have rotted away, leaving cavities, as at Rochester, concerning the use of which much nonsense has been written.

In considering the limited and very inconvenient accommodation afforded by a Norman

keep, it should be remembered that it was not meant for a residence, save during an actual siege, and that at such times it often only received the baron's armed tenants, and not his mercenaries. Indeed, the builders of some of these keeps seem to have mistrusted their own troops as much as they feared those of the enemy. The staircases and galleries are often contrived quite as much to check free communication between the several parts of the building as between its inside and its outside. Further, the excessive jealousy in guarding the entrance, the multiplied bridges, grates, doors, the steep and winding staircases, the sharp turns in the passages, although they helped to keep out an enemy, or if he got in, placed him at a disadvantage, also rendered impracticable the rapid re-entry of the garrison, so that if the court or outer ward were taken by assault, the defenders had scant time to retire into the keep, which was thus liable to a *coup de main*. Otherwise, with a sufficient and faithful garrison, and ample provision and military stores, a Norman rectangular keep was almost impregnable, so great was its passive strength. Its windows were too small or too high to be reached by fire-balls, and its walls were too thick to be breached or mined, if properly defended from the summit. This, indeed, was the true method of defence. An ordinary loop in a thick wall, however widely splayed, admitted of but little scope for an archer, or space to draw his bow. The lower loops were entirely for air, not for defence. Higher up, with larger windows, a bow could be used with advantage, but there were no flanking defences, for the angles had no considerable projection, and the shoulders, or lateral faces, were not pierced. With military engines for throwing heavy stones and masses of rock from the roof much might have been effected, but in the early keeps this was not contemplated, and probably not to any great extent in the later ones. An arrow shot from a battlement 50 ft. or 70 ft. high would lose some of its force in the descent. Of the siege of Rochester certain particulars are on record, and the account of the operations of the besiegers is confirmed by the evidence afforded by the existing keep. Rochester keep stands but 10 ft. or 12 ft. from the south-east angle of the outer wall, the angle of the keep corresponding with that of the wall. The angle of the wall and part of the adjacent curtain have evidently been removed and rebuilt, with the capping-tower, in a later style. Opposite and behind this newer work the lower part of the angle of the keep has also, at some remote time, fallen away, and with it a few yards of the adjacent sides. These parts have been rebuilt in a rude and slovenly manner, and the junction of the old and new work is very evident. This keep was built about 1130, and besieged by King John for three months in 1215. Military engines produced little effect upon it, but a mine was opened which, says Wendover, first brought down the walls and then a part of the tower. This is what we now see. The keep seems to have been repaired in haste at once, the outer wall probably not till 1225, when Henry III. spent considerable sums upon the castle, and the capping-tower of the curtain is of that date. The attack by sap was the only one available against a rectangular keep, and was rarely practicable. Where, as was often the case, the keep stood upon a rock, the running a mine below it would produce no effect. Where this was not the case, the foundations of the wall were so broad and so solidified as to stand even when much of the soil beneath them was removed. At the White Tower, for example, when it was found convenient to bring a railway from the river quay into the base of the keep for the shipment of stores, about 20 ft. of solid masonry had to be cut through, and much earth removed, and this, with every aid, was found to be a very tedious and expensive operation. The defence of such a keep was its passive strength alone. The loops were nothing in its defence; the roof being on a slope and of shingle, would support no military engine, and no great store of stones or heavy missiles. The narrow doorway did not allow of a sally in force, and when seriously attacked the garrison had no resource but to trust to the thickness of their walls, their ample supply of water, their magazines of provisions, and thus patiently to await relief.

Such are the details of the rectangular Norman keeps, of which we have in England about fifty-four extant or well-recorded examples dating from the year 1078, when the White Tower was begun, to about 1180, to which may be attributed the keep of Helmsley.

G. T. C.

LIST (APPROXIMATIVE) OF RECTANGULAR KEEPS IN ENGLAND.

Cheshire.—Chester.
Cornwall.—Carnbrè (?).
Cumberland.—Carlisle.
Derbyshire.—Castleton.
Devon.—Okehampton (?).
Dorset.—Corfe, Sherborne.
Durham.—Norham.
Essex.—Colchester, Hedingham, Walden.
Gloucestershire.—Bristol (destroyed).
Hants.—Christchurch, Porchester, Wolvesey.
Hereford.—Goderich.
Kent.—Canterbury, Dover, Malling, Rochester, Thurnham.
Lancashire.—Clitheroe, Lancaster.
Middlesex.—The Tower.
Monmouth.—Chepstow.
Norfolk.—Castle Rising, Norwich.
Northumberland.—Bamborough, Mitford, Newcastle, Prudhoe.
Nottingham.—Nottingham (destroyed).
Salop.—Bridgnorth, Clun, Ludlow, Wattlesborough.
Somerset.—Taunton.
Surrey.—Guildford.
Sussex.—Bramber.
Warwickshire.—Kenilworth.
Westmoreland.—Appleby, Brough, Brougham.
Yorkshire. — Bowes, Helmsley, Knaresborough (?), Middleham, Normanby (?), Richmond, Scarborough.

THE DIFFERENT MODES OF ERECTING IRON BRIDGES.

A VERY interesting discussion, on the subject of the different modes of erecting iron bridges, has taken place at the Institution of Civil Engineers. The subject was introduced in a paper written by Theophilus Seyrig, M. Inst. C.E., which possesses a permanent value, not only from the information which it contains, but as furnishing a sort of index to a number of important bridges, chiefly on the Continent, of which the English student is not so likely otherwise to hear. It may be worth the consideration of the Council of the Institution how far it may be desirable to publish papers of this kind as separate pamphlets. Access to that very valuable library, the Proceedings of the Institution, is limited in a great degree to the members. There are engineers in all parts of the world who are not members of the Institution, but to whom the subjects brought before that body are of essential moment. Very gladly would many of these men purchase separate pamphlets, such as that which the paper of Mr. Seyrig and the report of its discussion, would form. The funds of the Institution might be benefited by the sale; and the influence of the body would thus be extended into quarters where it is at present unfelt. We are the more induced to make this suggestion from the fact that the paper now in question is one far too full of detailed information to allow of being conveyed to our readers under the form of an abstract.

It was remarked by Sir J. Hawkshaw that it ought to be taken as an axiom that those who designed bridges should have reference to the mode in which it was proposed to erect them. It is possible that this is not always done with sufficient care. Mr. Seyrig's paper must have the effect of bringing this important part of the duty of the architect into full prominence. The cost of a bridge is not to be ascertained from taking out the quantities from the drawings. The erection is an integral part of the design, and it may happen in some cases that the design ought for this reason to possess special features, which will have no permanent value in adding to the strength of the structure, but which were essential in order to facilitate the process of erection. Such, in fact, is the very idea of the scaffolding.

The various modes of erecting iron bridges are classed by Mr. Seyrig as,—

1. Erection upon staging.
2. Erection by floating of girders.
3. Erection by protrusion, or pushing and rolling over of girders.
4. Erection by overhang, or building out.

Under the first head nine great bridges in France, Germany, Austria, and Holland, are cited as examples. One of these is the largest bridge in existence with horizontal girders. It is over the Lek, at Culenborg, in Holland, and has a clear span of 492 ft. The weight of the superstructure of this bridge is 2,150 tons, and the staging used to erect it contained upwards of 81,000 cubic feet of timber. This is equal to 37¾ cubic feet of timber per ton of superstructure, and is justly cited as an example of disproportionate expense on temporary work. In addition to this unfavourable feature, which characterises independent staging or scaffolding, the danger of interruption of the process of erection by floods has to be borne in mind. Apart from that risk, the safety and facility with which the permanent structure can be erected by this method are remarkable; and there is the further advantage that no part of the bridge is subjected to any undue strain during the process.

As to erecting by floating of girders, the first instance cited by Mr. Seyrig is that of the Britannia Bridge over the Menai Straits. Here, four tubes, each 470 ft. long, and weighing about 1,587 tons, had to be fixed at a height of 100 ft. above the sea, in a tideway exposed to violent gales. The tubes were constructed upon a platform 2,200 feet long, built upon piles 27 ft. apart, the whole containing 110,000 cubic feet of timber. The cost of the erection was 63,380*l.*, which comes to about 5*l.* 9*s.* per ton for fixing. This is a little more than one-fourth of the cost of constructing, which for labour and general expenses came to 19*l.* 8*s.* per ton. The Niagara Bridge is another instance of flotation. This part of the paper would be improved by more details as to the fixing of the Saltash Bridge, and by some account of the beautiful bridge over the Wye at Chepstow, which was fixed by means of flotation, after being protruded on the pontoons.

The disadvantages of the flotation method are stated to be mainly two. One is that it involves the employment of a special class of workmen not everywhere to be found, accustomed to the handling heavy craft on the rivers. The other is that the plant is apt to be disproportionately costly.

Nine examples are given of bridges with continuous girders, extending over several spans, which have been protruded, or rolled forward into place. When this method is applicable, great economy may be attained by its use. On the other hand, it is only applicable to a particular style of construction, and from the stress thrown upon the girders in their temporary position strain is likely to ensue, unless a weight of iron, which after fixing will be useless, and therefore detrimental to the bridge, is added to meet the strain thus caused. It is thus worthy of attention to inquire how far temporary ties or struts can be introduced into girders which it is intended thus to fix, in such a manner as to allow of their removal after erection. Such, in fact, would be a sort of self-contained scaffolding; we have not observed that this suggestion has hitherto been made.

The first instance of a bridge erected on the principle of overhang, or corbelling out, is said by Mr. Seyrig to be that of the El Cinca bridge, in Spain, having a single arch of 230 feet span across a very deep ravine, where it was extremely difficult to erect any staging. Cast-iron anchor plates were fixed behind the top of the abutments; and the arched rib and horizontal chord were built outwards, panel by panel, each half of the arch thus remaining as a cantilever until the junction was effected. The process proved costly. The weight of the bridge was 248 tons, and the cost of erection amounted to 2,200*l.*, or about 8*l.* 17*s.* per ton.

Another example of this mode of erection is the steel bridge over the Mississippi at St. Louis, having two side arches of 502 ft. span each, and a centre arch of 520 ft. In that case the estimate was exceeded by 50 per cent., and the excess is partly chargeable to the difficulties of erection.

The most recent examples cited of erection by over-hang is the railway-bridge of the river Douro, near Oporto, built by MM. Eiffel et Cie. The river at the point of crossing is deep, and the bottom is unsuitable for the construction of piers. A central span of 525 ft. was therefore adopted, the piers for which were originally designed as clustered columns, but were built of masonry. The extrados of the central arch is 200 ft. above the water. On the Oporto side, or right bank, are two spans of 94 ft., and on the Lisbon side three similar ones, all crossed by straight continuous girders, resting on framed iron piers. The arch consists of two ribs,

framed in the form of crescents, having a depth of 32·8 ft. at the crown, and tapering down to the springing. The faces of these ribs are inclined, from a width of 49 ft. apart at the springing to 13 ft. at the top, the object being to resist the fury of the storms to which the structure is exposed. The total length of the metallic structure is 1,163 ft. The weight of the ironwork in the arch is 504 tons, and that of the girders, supports, and permanent way over the arch, 223 tons, making the total weight of the centre opening 727 tons. The cost of this bridge is stated at 49,000*l.*, and Mr. John Dixon justly remarked that the French engineers deserved every credit for the skill manifested in the design, and for the strikingly-imposing lines of the structure. It may be questioned, however, whether the contrast pointed out by Mr. Dixon between "the light and airy character of the French works and the more substantial works to which English engineers are accustomed," is altogether borne out by the cases of the Tay and the Solway viaducts. At all events, the elegant mode of obtaining resistance to wind-pressure above described had no counterpart in either of the Scottish structures.

As to the cost of erection by building out, it is difficult to give an exact figure. The tenders for a second Douro Bridge, designed by M. Seyrig, on lines very similar to those of the first, range from 21*l.* to 24*l.* per ton. In a similar bridge in France, where the span is 15 ft. more, and the girders are considerably higher, the French Government engineers have consented to pay 12*l.* per ton more for the erection of the centre than for that of the side spans. On a review of the entire discussion, while it is evident that the local features must have great importance in each case in deciding the cheapest mode of erection, and thus in influencing the design, the greatest advantage as to economy seems to be in favour of the protruding method. It is the more important, therefore, for architects engaged in the design of large iron structures to turn their attention to that suggestion which we have above ventured to make, namely, to the design of continuous girders provided with an additional temporary bracing, proper to prevent undue strain during the process of running out, and capable of removal when the girders are finally fixed in place.

PONTELAND CHURCH, NORTHUMBERLAND.

ON Saturday, the 26th ult., St. Mary's Church, Ponteland, was re-opened for divine worship, after having been closed for some months for reparations and alterations. This is an extremely interesting and venerable edifice, standing in an old churchyard on a knoll in a pleasant old-fashioned Northumbrian village, about eight miles to the north of Newcastle-upon-Tyne. In the vicarage grounds is an old pele-tower, and the village hostelry has also a pele-tower, incorporated with other Mediæval features. Altogether, the place bears the aspect of old Border-life, and the church has the same impress. Golden-grey in the sun, and green-grey in the shade, the venerable fabric seems to tell us the history of the locality for the last eight hundred years. There is a mellow porch with a deeply-recessed stone-ribbed vaulting, and long low seats to invite entrance. At the west end of the nave we may see the remains of the edifice reared by the Norman builders, after the conquerors had built themselves the new strong castle at Newcastle-on-Tyne. And as we continue our examination the old stones show us where the masons made Early English additions, and where the frequent inroads of the Scots were considered in the forming of a strong tower, and, later on, where great extensions were made in the Decorated period.

It is a large cruciform church, with north and south aisles to the nave. The massy old tower is at the west end. As we have indicated, the western wall of the lowest stage of the tower is a portion of the little Norman church in which the faithful gathered together seven or eight hundred years ago. The tower-builders just reserved the small doorway with its pillars and carved tympanum, and the masonry round about it, and discarded the rest, except a fragment of the masonry now over the chancel arch. On the floor are many memorial slabs, and on the walls are several mural tablets, for in this hallowed spot the local gentry buried their dead for many generations. As we look around, we observe further indications of alterations that have been made since the head corner-stone was first placed. It is evident that Early English builders brought their scaffolds, tools, materials, and appliances to the low compact Norman structure, and took down the sturdy walls of the small nave to throw out an aisle on either side of it, with arcades of pointed arches that were tall and light, by the side of the old semi-circular headed openings of the first masons; and then they added transepts lighted with lancet windows, and also lengthened the edifice with a longer chancel, making a total length of 120 *ft.*, and raised a comparatively light and lofty pointed chancel arch. This must have been about the time the tower was built, when for greater security, probably, they retained the old small Norman doorway, as being more easily defended; and so this relic has been handed down to us with the old bolt-holes for the strong bars that were the fastenings of those days. After the lapse of another century, when their accomplished work was no longer equal to the requirements of the time, another set of masons came upon the scene, and alterations were made, which included the substitution of large three-light windows with traceried headings for their long narrow lancets. Very rich the building had now become, and we are told it was for some time a collegiate church. These were the days of Walter de Merton, who associated Ponteland with Merton College by gifts of land. We may assume they were the best days of the edifice. For gradually the roofs were lowered, windows blocked up, the chancel step lost by accumulations which raised the floor of the nave, flat plaster ceilings introduced, the west doorway blocked up, a fireplace built against it, the tower neglected, decay insidiously made its way. Not but that various remedial measures were taken in the next two centuries to preserve the fabric. A date upon a sundial over the doorway of the south porch,—1686,—doubtless marks the period of a renewal of interest and solicitude about it. Possibly repairs were made at this time, too. And we know there was an extensive reparation of dilapidations made thirty years ago, and a restoration of the chancel at the expense af Merton College fifteen years ago. But when the present vicar, the Rev. W. L. J. Cooley, M.A., came to the benefice, he found the church in a forlorn condition. The rain, soaking in through the weather-worn roofs, had saturated the plaster ceilings, and caused them to fall in dangerous masses; the timbers were rotten; sash-windows had supplanted the traceried fenestration of Walter de Merton's time; damp pervaded the walls; and there was a general aspect of melancholy.

The restoration now effected has been made under the auspices of Mr. F. R. Wilson, architect, Alnwick, the diocesan surveyor for the Archdeaconry of Lindisfarne, by Mr. James Gibson, Newcastle. The nave and transepts have been re-roofed; the floors re-laid with cement, and the opportunity taken to regain the lost chancel-step; the sash-windows removed; a vestry has been panelled in at the west end of the north aisle, and enriched with open oak tracery work; and the tower-space has been opened out and thrown into the church.

Mr. Carr-Ellison, of Dunstan-hill, has intimated his intention to be at the cost of the restoration of the upper stages of the tower in the course of the present year.

In every particular the reverential and historical aspect of the ancient fabric has been carefully maintained.

Liverpool Engineering Society. — At the fortnightly meeting of this society, held at the Royal Institution, Colquitt-street, Mr. A. Holt, M. Inst. C.E., in the chair, a paper was read by Mr. J. F. Aspinall, on "Automatic and Non-Automatic Vacuum Brakes." The author first described the working of the "Smith Vacuum Brake" on the Great Southern and Western Railway of Ireland, pointing out some of the improvements which had been made in the working parts since its first introduction from America. Great stress was laid by the author on the necessity of applying the brakes as gradually and lightly as possible, so as not to inconvenience the passengers. The author then described the "Automatic Vacuum Brake" which he had patented, and which is in use on the London and South-Western Railway, and other lines in England.

THE ROYAL ALBERT HALL.

THE annual general meeting was held on the 26th ult. The Right Hon. Lyon Playfair, M.P., in the chair, in proposing the adoption of the report, commented on the chief points in it, and showed the satisfactory progress that had been made in paying off liabilities. During the past year there had been given twenty-six concerts, twelve oratorios, six miscellaneous, three orchestral, and five operatic concerts. The oratorios this year would be interesting on account of the Choral Society having arranged with Mr. Sims Reeves to give a series of seven oratorios, and these would be the last public oratorio concerts at which Mr. Sims Reeves would sing. Sir Julius Benedict had expressed a desire to give his annual concert in the hall, and arrangements were in progress with Mr. Gye for operatic concerts on the same scale as heretofore. The council had found that the difficulties in obtaining a sufficient attendance at the Hall had been on account of the want of proper approaches, and they were glad to announce that there was a prospect of increased facilities of access to the eastern entrances by the formation of a road between the Kensington and Exhibition Roads.

Mr. Godwin, in seconding the adoption of the report, which was carried unanimously, drew attention to the proposed exhibition, at the Hall, by the Society of Arts, of works of industrial arts, for the best specimens of which the Society propose to award medals.

Sir Henry Cole mentioned the intention of the Council of the Albert Hall to offer space for all pictures accepted by the Royal Academy, but not hung for want of room.

Mr. Warren de la Rue, Mr. Jas. Heywood, and other members of the Corporation took part in a friendly discussion which followed, and resolutions were passed requesting the Prince of Wales to act as president of the Hall, and re-electing the retiring members of the Council,—the Duke of Edinburgh, Lord Clarence Paget, Mr. Warren de la Rue, Sir Michael Costa, and Mr. C. J. Freake, Mr. Thomas P. Chappell being elected a member in the place of Mr E. A. Bowring, C.B., who resigned on account of ill-health.

On Tuesday last, a Welsh festival was given at the Hall with Mr. Carter's choir, and some first-rate soloists; and on Wednesday evening, the Royal Albert Hall Choral Society, under the *bâton* of Mr. Barnby, gave a very fine presentation of the "Messiah." The hall was crowded.

THE CARNIVAL IN ROME.

A CORRESPONDENT from Rome describes the Carnival in that city as having been celebrated with unusual splendour this year, although he remarks that the festival is chiefly supported by foreigners, the Italians having apparently lost much of their taste for this description of amusement. The English contribution consisted of a burlesque St. George and the Dragon. St. George, who was represented by Mr. Corbett, a painter, was sitting in a suit of armour, with sword, lance, &c.; but in lieu of leg-pieces his nether limbs were swathed in bands. The mask of the saint was a hideous caricature of an Englishman with big whiskers, red nose, and an enormous collar. He carried, slung behind him like a carbine, an enormous umbrella, together with a field-glass in a case and a brandy-flask, and in his hand he held the inevitable red guide-book. The pennon of his lance was about 12 ft. long, and bore the motto, "Honi soit qui mal y pense." The dragon was at least 25 ft. long, and was supported by three or four men who walked inside. On arriving in front of the jury-stand on the Corso the knight gazed upon it with astonishment, and immediately applied himself to the guide-book for information. This proceeding raised shouts of laughter, and the representation was awarded a prize by the jury!

The pupils of the French Academy got up a magnificent symbolical car, representing the Tiber and the Seine. In the midst of the car was a statue of Minerva, and around the statue rode the students dressed in costumes of the period of Charles IX. The car was of white and gold, and was drawn by six white horses, richly caparisoned; the riders were also in costume, and blowing trumpets.

The most successful pageant was an Arab cavalcade, got up by the *Circolo Artistico*, or Roman Artists' Club. This was composed of about one hundred persons dressed in real Arab costumes, with costly arms and musical instru-

ments. Two palanquins carried the Sheik, with the Sheik's chief favourite, attired in magnificent dresses. The effect is described as being superb in arrangement, colour, and detail, the dresses having being lent for the occasion by a wealthy lady who had recently returned from the East.

CEMETERIES.

THE fourteenth series of "Model By-Laws" issued by the Local Government Board relates to the management of cemeteries, and must be looked to by both Urban and Rural Sanitary Authorities. A useful memorandum on the Sanitary Requirements of Cemeteries, by Dr. Parsons, their medical officer, accompanies the by-laws.

The sanitary requirements for a cemetery may be summed up under four headings:—

1. Suitable soil, and proper elevation of site.
2. A suitable position, especially with respect to houses and sources of water supply.
3. Sufficient space.
4. Proper regulation and management.

We print Dr. Parsons's remarks under the first and second heads:—

1. The soil of a cemetery should be of an open porous nature, with numerous close interstices, through which air and moisture may pass in a finely divided state freely in every direction. In such a soil decay proceeds rapidly, and the products of decomposition are absorbed or oxidised. The soil should be easily worked, yet not so loose as to render the work of excavation dangerous through the liability to falls of earth. It should be free from water or hard rock to a depth of at least 8 ft. If not naturally free from water it should be drained, if practicable, to that depth: to this end it is necessary that the site should be sufficiently elevated above the drainage level of the locality, either naturally, or, where necessary, by filling it up to the required level with suitable earth. Loam, and sand with a sufficient quantity of vegetable mould, are the best soils; clay and loose stones the worst. A dense clay is laborious to work and difficult to drain; by excluding moisture and air it retards decay, and it retains, in a concentrated state, the products of decomposition, sometimes to be discharged into graves opened in the vicinity, or sometimes to escape through cracks in the ground to the surface. A loose stony soil, on the other hand, allows the passage of effluvia.

2. The situation of a cemetery requires consideration from several points of view, of which the most important are its position with reference to dwelling-houses and sources of domestic water supply. While public convenience requires that the cemetery shall not be too far distant from the population for which it is intended, a due regard to public health requires that it shall not be dangerously near. The most suitable distance will vary in different cases; it will be greater in the case of a large than of a small cemetery; greater also in the case of a large and rapidly-extending town than in that of a small and stationary village. With regard to the minimum distance which should intervene between burial-places and human habitations, the Burial Act of 1855 prescribes that no ground not already used as a cemetery shall be used for burials under that Act, within a distance of 100 yards from any dwelling-house, without the consent of the owner, lessee, and occupier of such dwelling-house. In the Local Government Board's circular letter of August 19th, 1879, explaining the provisions of the Public Health (Interments) Act, it is pointed out, in accordance with Section 10 of the Cemeteries Clauses Act, 1847, incorporated therewith, that a cemetery is not to be constructed nearer to any dwelling-house than 200 yards, except with the consent of the owner and occupiers. In France the prescribed minimum distance of a cemetery from the nearest habitation is 100 mètres (109 yards), and it is not lawful without special permission to build any house or dig any well within that distance of an existing cemetery. It may be taken that a distance of 200 yards is amply sufficient to prevent any injury arising to health from a well-kept cemetery, so far as regards noxious matters transmitted through the air. It is, however, by no means certain that cemeteries established under the Public Health (Interments) Act will in all cases and at all times be distant as much as 200 yards from the nearest human habitation. With the consent of the owners and occupiers of existing houses, a cemetery may be established within the prescribed limit; and it is competent to any one afterwards to erect a new house as near to a cemetery as he pleases. It does not appear that the amount of danger to health to be feared from proximity to a well-kept cemetery is large. Since intramural interment has been abolished, recorded cases of injury to health, or even of nuisance arising from graveyard emanations, whether conveyed by air or water, are extremely rare. Dr. C. A. Cameron ("Manual of Hygiene," p. 253) shows that the amount of organic matter deposited yearly in a well-kept cemetery is less than the amount removed from its surface in the form of vegetation, and considerably less than that spread as manure over a cultivated field. There is, therefore, no reason why a cemetery should necessarily be a nuisance, or become a source of danger to the health of those living near it. Nevertheless, in view of the evils which in former times have undoubtedly arisen from the practice of intramural sepulture, and also because the erection of houses near a cemetery interferes with the free play of air around and over it, it is desirable that the site of the cemetery should be in a neighbourhood in which building is not likely to take place, and also that, so far as practicable, a belt of ground should be reserved between the graves and the nearest land on which a house may be built, in order to obviate to some extent the risk of contamination of ground-air and subsoil-water with decomposing matter. This is especially necessary where houses are constructed with cellars. It is, therefore, highly desirable that interments should not be made up to the extreme edge of the cemetery, and it would be possible, without great waste of space, to reserve in all cases a strip of ground free from interments, 15 ft. to 30 ft. in width, around the whole cemetery on the interior of the boundary fence. This strip would afford room, on the inside, for a gravel or asphalte walk to give access to all parts of the cemetery, and on the outside next the fence to a belt of shrubs or trees, the rootlets] of which, penetrating the soil, would arrest and assimilate any decomposing matters percolating to the exterior of the cemetery. Obviously a cemetery should not be placed on elevated ground above houses, where the soakings from it may percolate to the sites and foundations of the dwellings below.

If there be a mortuary or chapel attached to or within the precincts of the cemetery, care should be taken to see that both are efficiently ventilated by permanent openings of adequate size, near or below the floor-line for inlet, and in the ceiling for outlet of air. The chapel should be fitted with an iron trellis-work gate in the porch, so that the wooden door may be kept open in fine weather.

UNIQUE COIN.

SIR,—The *Jewish World* of the 7th of January contains so extraordinary an account of "one of the most ancient Jewish coins known," that I procured a cast of the object in question through the accurate and reliable hands of Mr. Ready, of the British Museum. The object is certainly very curious, but no one familiar either with the known specimens of Jewish money, or with the Jewish law, whether written or oral, can regard it as a Jewish coin.

The diameter is ⅝-in. On the obverse is a helmeted and bearded head, which presents the peculiarity of a Greek helmet in profile, while the face is so far turned to the right as to show both eyes, and a full round beard. On the reverse is a seated figure, bearded, in garments descending nearly to the ankle. The right arm and hand rest on the knee; the left hand is held out, and supports a bird. Before the figure, rising a little above its knee, is an object which bears the features of a human face, looking toward the seated figure. The seat itself is supported on a four-spoked wheel, with a disproportionately large nave. The back of the seat is curved and reeded. It may possibly be intended to represent a wing; but this is extremely doubtful. On the upper part of the field, level with the head of the figure, are three sharply-cut characters. Of these the first is the Aramaic Yod, of the form and set at the angle that are found on the coins of Antigonus. The second character is one that is not found on any known Jewish coin. It more closely resembles the Vau of the coins of Alexander I. than any other type, but is not precisely the same as that. It consists of three lines meeting at the apex, and it would hardly have been considered to be a letter if found alone. The third letter, behind the head of the figure, somewhat resembles the Vau of the Moabite stone. It is not, however, identical with that character, but more closely resembles one of the "early Hebrew" forms of Resh, as figured by Ballhorn, who also figures a hieratic Lamed, something resembling the second character on the coin. It should be mentioned that the seated figure is surrounded by beaded lines forming a square, as large as the coin has room to admit.

It is difficult to offer any theory as to this curious object. Its discovery among the coins of the British Museum is probably conclusive against the theory of, at all events, recent forgery. The obverse has Greek affinities, the reverse rather points to Assyrian influence. The face on the ground,—if it really be such,—is purely grotesque. The characters may be Phœnician, but the three are not to be found together in any published alphabet, on any Hebrew coins, on the Sidon inscriptions, on the Nineveh objects, or on the Moabite stone. It is for the experts in coins to indicate the date. But it can only lead to loss of time to assume that an object bearing three,—or at all events two,—portraitures of the human face and form, is either Jewish or Moslem. Nor can we think that the workmanship denotes a very remote antiquity. The theory that the letters indicate the Sacred name is one the inherent objections to which are rather strengthened than removed by comparison with known Phœnician and Aramaic types. It is inconceivable that the Jews should have placed the "Name" on a coin, and it is difficult to imagine what other people would have so done.

It must be admitted that the union of Greek, Aramaic, and Assyrian characteristics on the same object, in so far as they may indicate a local origin, is suggestive of the extraordinary novelties that we have some reason to hope will reward the exploration of Eastern Syria, on which the officers of the Palestine Exploration Fund are now on the point of entering. X.

A TOMBSTONE DISPUTE BETWEEN AN ARCHITECT AND A STONEMASON.

JACKSON *v.* STEVENS.

AN action arising out of the supply of tombstones was tried at the Westminster County Court the other day, in which the plaintiff, a stonemason at Norwood, sought to recover 26*l.* 15*s.* from the defendant, an architect and surveyor, of Southampton-buildings, Holborn. The plaintiff's case was that in May last the defendant called upon him with drawings of three tombstones and a cross, to be erected in Farnham Cemetery, and entered into an arrangement with him to furnish them. He executed the work under the defendant's superintendence. In cross-examination, the plaintiff admitted that he signed a contract by which he was to form proper foundations for the stones. He further admitted that under some of the stones he had merely put a stone base, whilst the others were without anything whatever. On behalf of the plaintiff, a witness was called who stated that the custom of the trade was not to put any foundations under tombstones.

The defendant's answer to the claim was that he received estimates from the plaintiff for the erection of the tombstones, according to the drawings and particulars supplied. He impressed on the plaintiff the necessity of departing from the ordinary way of doing this work, and of putting in a solid foundation to keep the stones in position, and this was embodied in a contract signed by the plaintiff. The plaintiff, after failing to keep an appointment when the stones were to have been put in position in the defendant's presence, arrived with them the day afterwards, and erected them as he pleased. Subsequently the defendant inspected them, and finding them loose, declined to pay for them. In November last, finding them all out of perpendicular, he instructed Mr. Duke, a builder, of Farnham, to carry out the terms of the contract, which was done at a cost of 3*l.* 12*s.* The sum of 23*l.* 15*s.* had been paid into Court by the defendant, and it was stated on his behalf that his expenses in all exceeded the amount of the plaintiff's claim.

The Judge, without calling for the defendant's skilled witnesses, said it was clear that the plaintiff had not fulfilled his contract. He

added that he was surprised to learn from the plaintiff and his witnesses that the usual way was not to put in any foundation, a proceeding which, he observed, contributed to the state in which so many burial-places now were with regard to the monuments. He gave a verdict for the defendant with costs on the higher scale.

BUILDING NOTES FROM BRISTOL.

BUILDING of a general description is still very dull in Bristol, but several important works are just completed, or nearly so. Amongst them, perhaps the most noticeable to visitors is the block of buildings erected by Messrs. Dunlop, Mackie, & Co., the well-known wine and spirit merchants, of Bristol, Gloucester, Cardiff, and other places. These are at the end of New Baldwin-street, a thoroughfare which was a few months ago cut through a network of houses (some of a very low class), and which will, as soon as the tramway company's contractor has finished laying the metals along it, become the great highway for traffic from the Railway Station to the Clifton end of the town. Though Messrs. Dunlop & Co. have large business establishments in other parts of the country, none of them approach in size or architectural pretensions the one just built from the designs of Mr. J. Beaven, a local architect, known in connexion with other buildings in the neighbourhood. The premises have a continuous sweep of façade of 179 ft. on the north side, or that of the new street, and 55 ft. of east frontage in Marsh-street. The cellarage alone covers 9,000 superficial feet, and extends beneath the whole site, and some 16 ft. under the pavement and roadway. From the street level to the top of the dormers enriching the front of the Mansard roof, the height is 60 ft., and to the top of the turrets at each end of the line of premises, 80 ft. The building is in the French Renaissance style. The New Baldwin-street front is divided into four sections, marked externally by piers of Bath stone, and broken up in detail by the boldly-arched doorways and windows. In addition to affording the accommodation required by the firm erecting the buildings, several well-appointed suites of offices are provided, there being no fewer than sixty-three apartments available for the use of professional men. The ground-floor has a fireproof ceiling by Dawnay, of London, the spaces between the iron girders being filled in by concrete. Messrs. Wilkins & Sons, of Surrey-street, Bristol, were the builders, and Mr. E. Sheppard, of Bristol, undertook the carving.

On Wednesday, February 16th, a capital lecture-hall was opened at Redland, it having been erected in contiguity to Tyndale Chapel, with which it harmonises in style. The style of architecture is that of the Decorated period. The large lecture-hall has a lofty open-timbered roof, with a gable at each end, and a bold gable on either side. It is lighted by four large round windows, one in each gable. It is 52 ft. 3 in. long, and 33 ft. 3 in. wide, and is calculated to seat 250 persons. At one side of this hall, and between it and Greenbank-road, are two small lecture or class rooms, one 32 ft. 3 in. long, and the other 21 ft. 3 in. long, and each 17 ft. wide. These two rooms communicate with the large lecture-hall. On the other side is a third class-room, 15 ft. by 14 ft. 6 in. There are several entrances appropriately situated. The lecture-hall, other rooms, and the corridor are heated by Skinner's system of hot-water apparatus. The contract for the work was 2,670*l.*, and the whole has been carried out and finished very satisfactorily by Messrs. E. C. Howell & Son, from designs by Mr. Henry Crisp, architect, Bristol.

The builder has just finished a new Baptist place of worship at Knowle, and the date of opening is already fixed. The new building is an example of conventionalised Italian architecture. It is planned and erected with a view to eventually introducing end and side galleries. The chapel provides sitting accommodation for 520 persons, and when the proposed galleries are added 820 persons can be comfortably seated. The length is 75 ft., the width 40 ft., and the height to the collar-beams 36 ft. At the rear are three conveniently-arranged vestries, with a staircase descending to a spacious schoolroom, which, although under the chapel, will, when in use, be well lighted and open to the road, the site favouring such treatment. The schoolroom is 12 ft. high, and with its two class-rooms will accommodate 280 children. The walls throughout are built of Pennant stone, with Bath-stone dressings. The roof is open and boarded, and externally covered with tiles. The rostrum is placed on a raised platform with four or five steps, and ornamental balustrade on each side; it has a handsome front of arched panelled and moulded raised work, with heavily moulded and cut top, and, in harmony with the pews and roof timbers, is stained and varnished. In front of the rostrum is the baptistery, lined with white enamel bricks, and provided with solid freestone steps. A spacious vestibule and lobbies are constructed at the entrance, in which are sets of doors, so that when the front entrance doors are open no draughts can enter. Great care has been taken with regard to ventilation and the acoustical properties of the building. Mr. A. J. Beaven was the contractor, and Mr. A. Harford the architect. The contract was for 2,175*l.*

Some time ago the *Builder* mentioned the progress being made with the St. Philip's Vestry-hall. It has just been completed and opened. The style is Italian. The dimensions of the hall are 71 ft. 6 in. long by 50 ft. wide and 33 ft. high. The ceiling is panelled with pitch-pine mouldings, and the compartments are plastered. The walls are to the height of 10 ft. of red and black tiles finished off with a white border, and above that is stucco relieved with tiled panels. Besides the one large hall, offices for parochial purposes are provided by the building. The cost has been 4,000*l.* Messrs. Wilkins, of Surrey-street, were the contractors; and Mr. S. C. Fripp was the architect.

By direction of the Sanitary Committee, experiments have been made with the electric light in some of the principal streets. The "Brush" Company's generator and lamps have been used, the system being one that is in use at Paddington Station, and in many large factories, &c., in England and America. The results of the tests as regards light (the cost has still to be gone into) are so satisfactory that a hope is general that some portions of the city may be permanently lighted by means of electricity. The light is now being tried in the machine and composing rooms of the *Western Daily Press* with much success. The heated and vitiated atmosphere of the latter apartment when illuminated by gas has given way to cool and comparatively pure air.

PATENT RECORD.*

APPLICATIONS FOR LETTERS PATENT.

702. G. Butler, Chiswick. Floor cramps. Feb. 18, 1881.

705. F. W. Fletcher, Westminster. Metal substitute for putty. Feb. 18, 1881.

706. J. H. Jack, Edinburgh. Kitchen ranges. Feb. 18, 1881.

707. R. Brierley, Preston. Securing window-blinds to the rollers. Feb. 18, 1881.

709. J. W. Butler and M. Dale, Westminster. Making concrete or cement pipes (partly com. by C. A. Berthelet, Milwaukie, U.S.A.). Feb. 18, 1881.

717. J. Woodward, Wolverhampton. Fastener for doors, window-sashes, and frames. Feb. 19, 1881.

727. S. H. Adams, Leeds. Flushing and ventilating drains. Feb. 19, 1881.

735. J. Tattersall, Manchester. Preventing explosions in kitchen boilers. Feb. 21, 1881.

744. H. Skerrett, Birmingham. Door-chains. Feb. 21, 1881.

747. H. Defty, Middlesbrough. Stoves. Feb. 22, 1881.

769. H. Lecornu, Caen, France. Cooking and heating apparatus for kitchens. Feb. 23, 1881.

778. E. O. Mundy, Stratford. Valves for preventing the waste of water. Feb. 24, 1881.

NOTICES TO PROCEED

have been given by the following applicants on the dates named:—

February 22, 1881.

4212. S. & J. V. Day, Glasgow. Cooking apparatus. (Com. by D. MacAlpine, Philadelphia, U.S.A.) Oct. 16, 1880.

4292. D. S. W. Dawe, Isle of Wight. Portland cement. Oct. 21, 1880.

387. J. Britton, Stamford. Fire-grates. Jan. 28, 1881.

February 25, 1881.

4293. W. R. Lake, Southampton-buildings.

* Compiled by Hart & Co., Patent Agents, 28, New Bridge-street, E.C.

Gas stoves for cooking or heating purposes. (Com. by A. W. Morton, Brooklyn, U.S.A.) Oct. 21, 1880.

4295. P. Langridge, Eastbourne. Window sashes. Oct. 21, 1880.

4906. H. G. Grant, Manchester. Artificial stones. Nov. 25, 1880.

380. W. Leggott, Bradford. Closing and fastening doors. Jan. 28, 1881.

ABRIDGMENTS OF SPECIFICATIONS

Published during the week ending February 26, 1881.

2812. S. C. Taylor, Morton, and W. Riley, Keighley.

Opening and securing window-sashes. Fixes balance pulleys in the window-frame, and suspends the sashes by cord, &c., over the pulleys. The sashes are secured by a rack on one of the sheets, and to the window-frame is attached a single or double catch. The double catch prevents the window from being closed or opened from the outside. The single catch allows the window to be closed, but prevents it being opened from the outside. *Pro. Pro.* July 8, 1880. Price 2d.

2828. F. H. F. Engel, Hamburg. Impregnating and preserving wood.

The wood is placed in a vessel, and either boiled in water or exposed to steam for a certain length of time, varying with the kind of wood and dimensions of the pieces. The wood is afterwards placed in a mixture of lime-water and urine, and allowed to cool down. (Com. by J. D. Francks, Hanover.) July 9, 1880. Price 2d.

2830. A. Smith, Goudhurst. Securing glass in skylights, roofs, &c.

Uses strips of lead, which are moulded into the form of a flat-bottomed trough, with flanged edges. The lead is laid upon the rafters, and the bottom of the trough secured thereto. The vertical walls of the trough are then bent down on the flat portion, so that the flanges touch each other. The glass is then laid in position in the usual manner, and the flanges of lead are pressed down over the glass, securing it perfectly. By this method no putty or cement is required. July 9, 1880. Price 6d.

2933. C. W. Burge, Marylebone-road. Trapped gullies or gratings for stables, &c.

Formed so as to admit of easy access to the drain or cesspit beneath, but having a perfect seal against gases, &c. At the bottom of the outer case of the gully is formed a deep recessed groove to receive a tongue made round the edge of the trap. This groove is filled with water. On the top edge of the trap is formed a rim, which is shaped so as to leave a space between it and the outer case, which space becomes filled with sediment, and helps to form a perfectly air-tight joint, in conjunction with the water contained in the groove. The trap is curved downwards and inwards, which tends to flush it clear of all matter deposited in the sewage. July 16, 1880. Price 6d.

2455.—P. Adie, Pall Mall. Testing Cements.

An addition to the testing-machine of an escapement and pendulum. Instead of moving the testing-weight by hand or wheelwork, a spring or falling weight is attached, the movement of which is regulated by a pendulum and escapement, or a spring balance escapement. Thereby the element of time is introduced into the testing, and the different testings are more comparable the one with the other. June 17, 1880. Price 4d.

2983.—L. A. Groth, Finsbury-pavement Chimney Pots.

The lower part of the chimney-pot is fitted with a screw to fix it securely to the chimney-top. The upper part is narrowed so as to form a neck. The neck is provided with a number of openings, and the top has also a number of holes through it. A cover or cap is placed on this, provided with large supporting arms, which fit the broad lower part of the chimney-pot. These arms are arranged opposite the openings in the neck, and are secured by bolts. (Com. by P. Dencausse, Pantin, France.) July 20, 1880. Price 4d.

A BUILDING SITE NEAR THE NEW LAW COURTS.

A BLOCK of dilapidated ancient buildings in Wych-street, adjoining New Inn, has recently been demolished, with the view of the erection on the site of Law-court chambers and offices, in anticipation of the opening of the Royal Courts of Justice next year, and last week the land, which has an area of upwards of 6,000 ft., was offered to be let on a building lease, for a term of eighty years, by Messrs. Fox & Bousfield. Mr. Bousfield, who conducted the letting, adverting to the value of the land, observed that he did not mean to say it was worth as much as land in the City, but its intermediate situation between the City and the West End rendered it specially valuable, inasmuch as land in the City generally had already been dealt with, whereas this particular land, as well as other adjoining ground, had not yet been appropriated, but soon must be, in consequence of the expected opening of the new Law Courts next year, and therefore for all practical purposes it was of great value. With the exception of the new law-chambers in Carey-street, no blocks of such chambers had yet been erected in the locality in anticipation of the opening of the courts, and this particular land offered a favourable site for the erection of such buildings. He considered it was well worth 2*s.* per foot as the annual ground-rent, which would

amount to 600*l.* a year. The highest offer was 450*l.* per annum, being only 50*l.* per annum below the reserve of 500*l.*, at which it was withdrawn.

PROPORTIONS OF ROOMS.

THE subject of the proportions of rooms has often been discussed, but, as far as we are aware, never finally solved, and probably never can be, but it is, however, of interest, and a scheme may yet be granted some consideration. When reflecting on this subject, years ago, we soon arrived at an opinion that the relative proportions of a large room would be quite inappropriate for a small one,—as, for example, the double cube, which might do for a saloon 40 ft. by 20 ft.; but, on other hand, a room 20 ft. by 10 ft. would be very inconvenient. Rooms 40 ft. by 20 ft. we have seen in a house at Portland-place, and they were both handsome and useful. It was, therefore, necessary to devise a kind of sliding scale, giving more squareness to small rooms, and more length to large rooms. As to height, we leave that an open question, some would have more and some less. It would generally range from two-thirds to three-fourths of the width, and must depend on whether the apartment is lighted from the end or side or ceiling. Most frequently it would be from the side.

The scale we devised was as follows:—

Length.	Breadth.	Length.	Breadth.
50 ft.	... 30 ft.	20 ft.	... 15 ft.
40 „	... 25 „	18 „	... 14 „
36 „	... 23 „	15 „	... 12 „ 6 in.
30 „	... 20 „	12 „	... 11 „
25 „	... 17 „ 6 in.	10 „	... 10 „

The principle is very simple, namely, that starting with a room 30 ft. by 20 ft., we add or subtract 2 ft. from the length for every 1 ft. of the breadth. Thus, if a room is intended to be 22 ft. long (that is, 8 ft. less than the 30 ft.), then the breadth should be 4 ft. less than the 20 ft., or leaving 16 ft. Any one can carry the rule in his memory without much difficulty, simply calling to mind 30 by 20, and making an allowance of 2 ft. of length for every 1 ft. of breadth, whether increasing or diminishing in size. We venture to think that the scale above given is of practical dimensions for dining-rooms, drawing-rooms, very nearly of billiard-rooms, and, as it descends, of other apartments. Of course, no one would be so absurd as to advocate every room in a house being strictly to such a scale, but it affords hints of proportions which would generally be useful and appropriate.

H. & R. POWELL.

THE SEWAGE AND THE SEA.

IN taking a walk of observation on the great sewage conduit from the sewage works at Stratford to Barking Creek, the quantity of foul gases escaping through the ventilating-gratings is such that if it were not for the mighty grandeur of the thing it would be just as well were it an open ditch, giving a more free and equal distribution of the gases to blend with the pure moisture floating in air, and ultimately to be deposited on the land or sea, and give nourishment to the flora thereof.

Surely there is something very rotten in civil engineering if this is the best way of removing the excreta of our tidal river towns. At all events, we might have more for our money on my system, which, in this case, would be to excavate a canal from the sea, either through the Essex marshes (on the north side), or from the Medway, at Rochester, up as high as the St. Katherine Docks or Wapping,—a canal 180 ft. wide and 45 ft. deep, at high tide, with Clough gates to be shut by the attempted outflow of the tide at the sea end, and Clough gates to be shut by the attempted flow of the Thames at the London end.

Through this channel would flow a body of sea-water every tide, which, by its greater density would cause the deposits of sewage to be carried by it out to sea to enrich the pastures on our fishing-grounds, each such body of sea-water would be forced up the river some miles every tide, to come back loaded with sewage matter in the increased variety of combinations created by Nature's laws of affinity, with all its purifying influence, in all probability rendering it a rich feeding flood for fish to revel in; for it is one of God's great gifts to man that when by His laws in nature matter is transformed, beauty adorns the scene of action.

Such a canal might be furnished with landing-wharfs or quays on either side, with a railway on each side to convey the merchandise wherever desired.

PETER LOVE, C.E.

THE DRAINAGE OF MINING TOWNS.

SIR,—Your correspondent calls attention to a most important difficulty in sanitary engineering; but I wish he had given his opinion on the methods of proceeding in such cases, or even suggested remedies to mitigate the evils referred to.

The use of a cast-iron pipe instead of the ordinary brick sewer would have some advantages; it would take longer to become "broken-backed," and to leak under conditions fatal to an ordinary sewer; and if the weight were artificially distributed over a large bearing surface, a further resistance to sliding and unequal pressure might be obtained; but this would only lessen the evils.

It would be better, I think, in such cases, to abolish the ordinary house-drain altogether, and use dry earth-closets (under the supervision of the Sanitary Authority); surface-water could then be carried away to a natural watercourse by means of open channels of such proportionate depth and width as to produce a rapid flow of water, without fear of overflow or stagnation. By this means underground drains may be dispensed with. There are practical difficulties attending the use of dry earth-closets in large towns; but I believe that they can be made to answer every requirement for villages and small towns.

A. HARLAND.

PLUMBING WORK AND FREEZING OF PIPES IN THE UNITED STATES.

SIR,—A correspondent wishes to be informed how they manage the water arrangements in the coldest regions of the United States to prevent the freezing of the pipes in winter. I will first explain that in good tradesmen's houses, as a rule, very much more plumbing work and other conveniences are to be found than in English dwellings of like grade.

The rule there is to have enclosed permanent washstands, with sink, 1¼ in. marble slabs and skirtings, and moulded edges, to all the principal bedrooms; one of the same in the bath-room, and one also adjacent to the hall.

Invariably there is one, and oftentimes two bath-rooms, with w.c., sometimes arranged as urinal, by making solid round the basin and under the seat, and covering with lead, so that upon lifting up the seat proper it may be used as a urinal.

On the landing or staircase, where not unsightly, will be found a slop-sink of iron, either plain or enamelled, 12 in. square and 10 in. deep, thus preventing the chances of stoppage to the w.c. by throwing the contents of the slop-pail, inclusive of house-flannels, scrubbing-brushes, and sundry other articles, none of which should be allowed in any closet.

In the scullery will be found a cast-iron or soapstone sink. There is also in the laundry to be noticed a set of three fixed washtrays, made of clean pine of the full width of the plank, with proper wastes to the drain.

A butler's pantry is a very general attachment in American houses, where it would not be thought of in England.

All these arrangements, excepting the closet, are supplied with hot and cold water throughout.

In addition to the before-mentioned conveniences, will be found to every house supplied with water from the main a street-washer placed next the curbstone in front of the premises, and in use all the year round, for the purpose of washing pavements, fronts of stores, or inside floors of stores themselves. This stop-cock (not the useless screw-down arrangement imposed by the London water companies, but a veritable plug stop-cock, with screw bottom, it being by far the most efficient, for the reason that the screw-down ones get set for want of use, and are often useless when most wanted) is placed in the ground 4 ft. deep, as also are all the outside pipes and connexions, and, as a rule, may be depended upon in any weather, in case of accident or otherwise.

Having now very generally explained the nature and magnitude of the works to be combated with in case of frost, I will explain the first necessity,—that of common attention and care. All services to different portions of premises should lead to their required position from the basement, and graded; be as nearly as possible independent of each other, and provided with an arrangement for emptying any or all of the pipes as required. This can easily be accomplished by placing a stop-cock in the basement, and pipe from the same leading to the sink or drain, as convenient, the opening of which will cause all the pipes throughout the house to empty themselves upon giving air vent at the top, and leave the pipes waterless. Any separate portion of the premises not in use may be arranged in the same manner for one-half of the building, and the other continue in daily use.

It is necessary in connexion with the before-mentioned explanation I should state that in the houses out towards the colder regions, premises are warmed by means of hot-air from the furnace in the basement, supplying the warmth throughout the house, and regulated by registers placed in each separate room or other compartment. In very many instances the premises are warmed by the means of automatic steam boilers in the basement, and radiators with ornamental designs in the rooms and passages.

During very severe weather, the water is left running in a manner that would drive a London water official mad; yet it prevents freezing when the mercury drops far below zero; and sometimes, as in 1872-3, the mercury itself was frozen several days consecutively in the North-Western States.

In conclusion, I will explain that the hot and cold water pipes, with very few exceptions, are all lead, the advantages being the greater facility of repair; also the least trouble in leading them through difficult places, my own opinion being that iron pipe is not the proper thing to use in conveyance of hot or cold water throughout private dwellings, except with the desire to make a job of tearing up a great space to make repairs to pipes, and not likely to be necessary in the case of damage to leaden pipes.

The boiler should, in all cases, be provided with an emptying-pipe and cock attached to the bottom, and connected with the drain, in case of accident or need of repair.

The hot water in moderate-sized dwellings is obtained from the portable stove or range having a coil of four or five turns of pipe placed at the back or the side of the fire space in the stove, generally at the back, as the oven extends the full width; the range oven being in front, the hot water is placed at the side, and half or three-quarter inch pipe used. The boiler should in all cases be provided with a stop-cock and emptying-pipe at the bottom, and connected with a drain, in case of accident, or repair being required. The capacities of the boilers range from 30 gallons to 50 gallons, and from 10 in. to 12 in. in diameter, made either of copper or galvanised iron, and without any manhole. A large number of boilers are supplied direct from the main, and have a combination vacuum and safety valve on the top.

ABEL S. CHAPPELL.

"BOILER EXPLOSIONS."

SIR,—It is unquestionably a dangerous system, that of our "Yankee cousins," the one-pipe fitted cylinder, as, ordinarily fixed, it failing in one important particular, the water in consequence being acted upon by frost. Still it has some advantages.

In the hands of a well-known London firm the system has received such practical improvements as to render it at once the most safe and reliable system known.

If kept in regular use, it is totally impossible to disarrange it in the most extreme winter.

Safety-valves and like appliances are only "broken reeds" to rely upon; the whole thing must be automatic, properly arranged, and quite out of the control of servants.

To mention the name of the firm referred to might be construed as "partisan." I merely desire to point out the perfect immunity from danger obtainable; and it is quite clear that the many writers on the subject of boiler explosions whose emanations I have read have "something yet to learn."

JAMES FRANCE HILL.

VALUE OF A PRACTICE.

SIR,—I should be obliged if one of your correspondents would inform me upon what basis the value of an old-established practice of an architect is ascertained.

T.

ROMAN WORKS.

WOULD some reader kindly inform me if there is a work published treating of Roman construction, hydraulics, and sanitary matters? If so, the title of it?

INQUIRER.

THE PROPOSED MUNICIPAL BUILDINGS AT GLASGOW.

AN adjourned special meeting of the Glasgow Town Council was held on the 24th ult., to consider the question of the new municipal buildings. It may be stated that at the previous meeting the chairman (Lord Provost Ure) moved, in effect:—

"That the City Architect be instructed to reconsider the plans without reference to the area embraced in the present plans, and to rearrange and to adjust the same so as to show in what way public art galleries, public libraries, an official residence for the Lord Provost, &c., could be best provided."

On that occasion Councillor Walls put an amendment, of which the substance was as follows:—

"That in view of the decisions already come to in regard to the area, the City Architect shall receive no such instructions."

The discussion was resumed by Bailie Wilson, who supported the original motion. It was asked by Bailie Selkirk what sum they had at their disposal. The Town Clerk (Dr. Marwick) mentioned that the sum was £400,000. Councillor Neil was opposed to an official residence being provided for the Lord Provost.

The discussion was continued by Bailie Dunlop, Councillor Ure, and Councillor Reid. Councillor Jamieson made an amendment to the effect

"That the buildings be limited to the area already purchased; that the City Architect be instructed to prepare a plan to show the accommodation required; that it be left to the competing architects to show how this could be obtained; that the competition be an open one; and that the cost of the buildings be increased to about £350,000."

The amendment was seconded by Councillor Lamberton. Councillor Jackson moved another amendment, of which the following is an epitome:—

"That the City Architect be instructed to prepare, in addition to the present plans, an alternative sketch plan treating an extended area, and showing how the amount of building accommodation necessary for municipal purposes may alone be proceeded with at once, but in harmony with a building plan capable of extension, if required within the new area."

Lord Dean of Guild Mirrlees seconded the amendment. It was proposed that the discussion, which had lasted three hours and a half, should be again adjourned. On a division, it was resolved by 36 to 9 votes to proceed with it. Councillors Shaw, Millar, and M'Pherson, who spoke amid cries of "Vote, vote," continued the discussion. The Chairman, in reply, condemned the present plans on sanitary grounds, and accepted Councillor Jackson's amendment in place of the original motion. The proposals of Councillor Jackson and Councillor Jamieson were, in voting, put against each other, and that of the latter was carried by 28 to 17 votes. It was arranged to withdraw the amendment of Councillor Walls, and to allow that of Councillor Jamieson to become the finding of the Council.

PORTSMOUTH BUILDERS' BENEVOLENT ASSOCIATION.

THE fourth annual meeting of the Portsmouth, Gosport, South Hants, and Isle of Wight Builder's Benevolent Association was held on Monday night at the Railway Hotel. Alderman W. Pink, J.P., Mayor of the Borough, and President of the Association, occupied the chair. The Secretary, Mr. J. Street, read the annual report, in which it appeared that the funds of the Association are steadily increasing, but not to the extent the directors could wish, and they suggested that with a view to bringing the objects of the Association more prominently before the building trade, prospectuses be printed and circulated among the employers of labour connected with the trade in the locality, and they confidently hoped that that course would result in the Association receiving the support it so well deserved, and that for the future a clear income of at least 50*l.* per annum would be maintained. The directors regretted that an offer, made after the last annual meeting by Mr. G. W. Booth, of Bedford-street, Covent-garden, one of the vice-presidents, to give a donation of five guineas, provided the funds were increased to 150*l.* by the end of the year, could not be accepted. Mr. H. P. Foster, of London, had also taken a great interest in the Association, and had obtained the largest amount of contributions to the fund, for which the best thanks were tendered. The treasurer's account showed the assets to be 128*l.* 13s. 7d., of which 100*l.* was invested in 3 per cent. Consols, and the balance, 28*l.* 13s. 7d., was on current account at the bankers'. The dividends on Consols and the subscriptions due amounted to about 20*l.* The total expenditure during the year had been 4*l.* 2s. 10d., and the Association now consisted of 40 members, including honorary ones.

The president, in moving the adoption of the report, said he felt somewhat disappointed at it. In the first place it seemed rather as though the trade generally were not inclined to assist them in what he was inclined to think one of the best objects of the association, viz., the benevolent branch. When they considered there were only forty members—including hon. ones—it seemed as though there was either a fault in their endeavouring to get gentlemen to join them, or else a fault in gentlemen not joining them.

Mr. C. Light seconded the adoption of the report, and trusted that all the members of the association would try and induce at least one or two more to join, and if they did that by next year they would be in a better financial position than at present.

The resolution was then unanimously agreed to.

Mr. C. Light proposed the re-election of the mayor as president, remarking that his worship had joined them at their first meeting, and ever since he had at all times done his utmost to advance the association, and in every possible way assist its members.

Mr. Burbidge seconded the motion, which was carried *nem con.*

The following were then re-elected:—Vice-presidents: General Sir Frederick Fitz Wygram, Bart., Messrs. G. W. Booth, G. Rake, H. P. Foster, and H. Harding; directors: Messrs. F. White, B. Hayter, and B. Newton; treasurer: Mr. Roberts; solicitor: Mr. A. Addison; auditors: Mr. W. Payne and Mr. Lawrence. Mr. J. Street was unanimously re-elected honorary secretary.

WORKMEN'S DWELLINGS, MANCHESTER AND SALFORD.

AN effort is about to be made to provide improved dwellings for the thousands who in the districts of Manchester and Salford are living under conditions which have aroused the attention of the Manchester and Salford Sanitary Association.

As the result of several meetings, a number of leading citizens, including the Bishop, have formed themselves into a company, under the title of the "Manchester and Salford Workmen's Dwellings Company (Limited)," with a subscribed capital of moderate amount for their initiatory proceedings, but with power to extend the same, if, as they expect, they should succeed in demonstrating the practicability of conducting their undertaking on strictly commercial principles, and providing a return of something like 5 per cent. on the capital invested.

Their first efforts will be directed to the erection of separate and independent dwellings for those who cannot afford to pay more than two shillings and sixpence per week for such accommodation, and this price it is expected will compete with that paid in the slums and low lodging-houses.

The directors have appointed Mr. Lawrence Booth, F.R.I.B.A., of Manchester, as their architect to design and carry out their intended buildings, and when their intentions have assumed more definite shape we hope to chronicle a satisfactory solution of an important social problem.

LONDON SMOKE AND FOG.

WE have received from Mr. J. Phillips-Smith, the manager of the Heat, Light, and Ventilation Exhibition, just concluded at the Alexandra Palace, some results from experiments there, and a list of awards. We print a portion of his statement:—

"Having regard to the heading of this letter, the principal feature of the exhibition has been the burning of anthracite smokeless coal, in special and ordinary grates and stoves, and in the large boilers used for generating steam for heating the Palace.

The facts clearly show that if all London used only this coal the black density of our fogs would be done away with.

Messrs. Barnard, Bishop, & Barnard's grate undoubtedly burnt the coal to the best advantage; but an ordinary registered grate in the first-class dining-room burnt it almost equally well, giving a bright pleasant fire with a snapdragon flame, without smoke or smell. In Messrs. Brown & Green's Kitchener we frequently shut off the draught flues, removed the top plate, and then held over the fire, when fresh coaled and otherwise, a piece of white paper; there was no colouring and no smell; and once I fired this stove and got 550 degrees of heat (registered by the pyrometer) in the oven. I admit at once that a badly-constructed grate, with a bad draught, will not burn this coal to advantage. But the economy in the use of the coal is so great that it will pay to alter grates.

I can best illustrate this economy in what is to my mind the most important branch of this subject, namely, the use of the coal for steam purposes. It will take time to induce all London to burn this coal, even if we had many fogs like those of last Christmas. But when you can show manufacturers that they may save money and abate a great public nuisance detrimental to health and beauty, in all senses of both words; and when, besides, we know Local Boards, &c., have power to compel them to attend to the matter, we may expect some early successful results from our recent trials here in this direction, particulars of which are as follows."

A BUILDER FINED.

AT the Edmonton Petty Sessions, before Messrs. Abbiss, Nash, and Doe, divisional justices, R. Radley, builder, of 2, Newton-road, Page-green, Tottenham, was charged upon five summonses with violating the by-laws of the Tottenham Local Board of Health.

Mr. W. A. H. de Pape, surveyor to the Board, deposed that in September, 1879, the defendant deposited plans for the erection of five houses in Newton-road, and that the plans were approved, subject to compliance with the by-laws. Witness visited the buildings on the 17th inst., and found a very improper substance being used as a mortar, screened lime from old buildings, mould, and a very small portion of lime. The plaster upon the walls was composed of mould and screened rubbish from old buildings. The party and internal walls had been constructed of nearly all brickbats, but the facing was good.

Mr. Abbiss said the infliction of a fine, even to the full amount allowed by law, did not meet the justice of such cases. Here were houses which would be positively dangerous for people to live in, and he thought the Board ought to exercise what power they possessed in order to have the buildings pulled down. The Bench were determined to do all in their power to put a stop to this nefarious style of building, and ordered defendant to pay the full penalty of 5*l.* for each house, and a continuing penalty of 10s. per day for forty-four days in respect of the two concerning which notice had been given.

The same defendant was also ordered to pay 40s. for neglecting to carry a party-wall of a new building to the required height under the by-law of the Board devised for the prevention of fires.

BUILDERS' CHARGES FOR MAKING ESTIMATES.

MASON *v.* GOODACRE.

THIS was an appeal in the Common Pleas Division (before Mr. Justice Lindley and Mr. Justice Lopes) from a decision of the County Court of Leicestershire, and the case arose out of the following circumstances:—

When the Church Congress was about holding their meeting at Leicester, they advertised through the defendant, their architect, for the erection of a temporary building for their accommodation. The advertisement said that "the committee did not bind themselves to accept the lowest or any tender." The plaintiff saw the defendant about the matter, and asked for the quantities, which the defendant said he had not taken out. The case for the plaintiff was, that he had said to the defendant, "Provided I take out the quantities and my tender is the lowest, can I depend upon having the job?" and the defendant replied that the person who made the lowest tender would have the job. The plaintiff tendered for 1,474*l.* 10s., but notwithstanding what the defendant had said, a tender for 1,500*l.* was accepted. The plaintiff thereupon sued to recover from the defendant the cost of taking out the quantities, contending that he had been induced to incur this expense through the false representation that the lowest tender would be accepted. The County Court judge, however, nonsuited the plaintiff, saying that there could be no false representation of a thing that was *in futuro*. The question now was, whether the judge was right in so ruling.

Mr. Hensman appeared for the plaintiff, and Mr. Digby for the defendant.

Mr. Justice Lindley said that the facts set out would not support an action either for a false representation or upon contract. There was really no misrepresentation at all, and there was nothing but an expression of opinion on the part of the defendant as to what would happen.

The appeal was dismissed.

SURVEYORS' FEES.

MESSRS. TROLLOPE & SONS, builders, attended before Alderman Sir Andrew Lusk, M.P., at the Mansion House, upon an adjourned summons, at the instance of Mr. Collins, the District Surveyor for the Eastern portion of the City, for having, as builders of premises at Nos. 27 and 28, Nicholas-lane, neglected to give notice to him within two days of the commencement of the work, in accordance with the 38th Section of the 18th and 19th Vict., cap. 22.

Mr. Wontner, solicitor, defended.

Messrs. Trollope's explanation was that, thinking the premises in question were in the southern division of the City, they gave the requisite notice, and paid the legal fees to Mr. Power, the surveyor of that district, who had inspected the buildings and certified that all was correct. The premises, however, were shown to be in Mr. Collins's district.

Mr Collins now said that since the last hearing Mr. Power had paid over to him the whole of the fees, and had handed him the notice given him by Messrs. Trollope, and under these circumstances he asked that the summons might be withdrawn.

Sir Andrew Lusk, seeing that on the last occasion he made some strong observations as to Mr. Power's conduct in taking the fees for a matter in another surveyor's district, and in thus causing the summons against Messrs. Trollope to be issued, asked if he was present to offer any explanation?

Mr. Collins said he was not.

Mr. Wontner said Mr. Power was summoned to attend as a witness on the last and on that occasion, but he had thought fit to set the court at defiance.

Sir Andrew Lusk said Mr. Power had behaved in a way in which he should not have expected him to have acted and, if an application was made to him to compel him to attend, he should issue the process directly.

Mr. Wontner said no doubt the matter would be brought before the Metropolitan Board of Works, and that would suffice.

The summons against Messrs. Trollope was then withdrawn.

VENTILATION: CHIMNEY DRAUGHT AND SMOKY CHIMNEYS.

SIR,—In your issue of Feb. 19 appears a letter from Mr. F. Edwards, jun., on the above subject, which is full of the most misleading statements. So much attention is now being given to the subject of house sanitation, and the issues are so important, that any information given should be beyond suspicion, and those who have ideas to promulgate should, in common fairness, take all reasonable pains to test their conclusions. In his opening clause Mr. Edwards says that it is essential to understand chimney-draught. This is so. But when he says there are no means of measuring the passage of combustion gases through a chimney, he is in error, as he may prove by a visit to any alkali works, where he will find an "air-meter" in constant operation. If we are without a means of measuring, how does your correspondent know that as much as 60,000 cubic feet of air pass up some chimneys per hour? We are next informed that chimney-draught causes a reduction of pressure in the apartment, and from this results "closeness." In the first place, it would require a shaft 130 ft. high, filled with air at the temperature of melting lead, to reduce the barometric pressure $\frac{1}{12}$ in. in an air-tight chamber!

In the second place, even if the draught did make a sensible reduction in the chamber pressure, the latter is not the cause of "closeness." Did your correspondent ever climb a mountain? If so, did he find the air get "close" as he ascended, and the air-pressure, therefore, decreased? Mr. Edwards's statements are evidently evolved from his inner conscience, and while giving him credit for his endeavours to enlighten your readers, his first duty is to learn before he essays to lead.

R. H. RIDOUT, F.C.S.

"BUILDERS' FOREMEN."

SIR,—The letter, with the above title, signed "A Builder's Foreman," suggesting the formation of a benevolent association, is both worthy of the writer and of the times. I trust you will afford space in, and opportunity by, your valuable journal, to ventilate the subject far and wide. Never, perhaps, was co-operation among the respectable *employés* of the building trades more needed than now. A reference to your advertisement columns any week is proof at once of the necessity of immediate action. Like other trades and employments, there is more of the supply than of the demand. All cannot be employed. It is with those in employment to establish an association forthwith, with the object, first and foremost, to assist the ill or unemployed members, or both; but before this could be practically set in motion, a large sum would be necessary to obtain interest sufficient. A means of getting this interest other than by waiting for it to accumulate at bank rate can be obtained by co-operation. Let there be an association formed at once,—as preliminary,—among the respectable builders' foremen, managers, skilled officers, assistants, and clerks of works, and amount of subscriptions arranged, that a sum sufficient may be capitalised without delay, and a "stores" opened under the title of "The Building Trades Co-operative Supply Stores,"—to be developed with all energy until it becomes colossal in proportions. Success is certain, and the means to help its unemployed members at once secured. The success will lie with the members themselves, who will have power to issue tickets to those working under them, offering them the benefits of the stores. While we have the members of the Army and Navy, and Civil Service, and others, co-operating, I do not see why the members of the building trades should be idle. Their name is legion, spread far and wide, and their strength of numbers great, and, by the establishment of stores in all great centres in connexion with the head department, I feel certain the members who will band themselves together for the purposes mentioned will reap a rich harvest, and be free for ever from the immunity of want of employment or aid in sickness.

A BUILDER'S MANAGER.

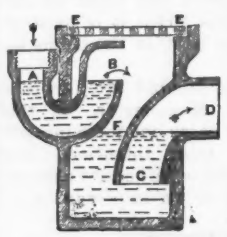
SIR,—I was very pleased to notice in the last week's *Builder* a suggestion from a Builder's Foreman to form a benevolent society amongst builders' foremen, and I hope it will meet with the success it deserves; and I should like some of your able correspondents to go in for it earnestly, as I am convinced that it would not only be a boon to us as a body, but it would often act as a channel for settling grievances and be the means of co-operating capital and labour.

I, as a builder's foreman, read the different opinions of writers and then have to draw my own conclusions, whereas if the different notes and opinions on sanitary or other questions could be properly discussed and thoroughly ventilated, there would be an invaluable benefit derived from it. The masters would then know where to look for men with whom to trust their business and interests, as I should suggest that an examination should be passed by all free members (say in building construction and geometry, strength, growth, and conversion of materials, their value and the value of labour attached), which would then prepare foremen to whom men could look with respect and masters with confidence, which would make better workmen and fewer builders bankrupt. I hope these remarks will meet with the approbation of all foremen and the support of all masters, and that the time is not far distant when the questions will be grappled with in the meeting-room.

ROSEBING.

THE WEATHERLY DISCONNECTOR WASTE-WATER TRAP.

As we have before now said, the one lesson which appears to have been the most completely learnt by the public is the necessity for disconnecting the waste-pipes of sinks, baths, lavatories, and cisterns from the house-drains and public sewers. An arrangement for effecting this without bringing into view the slopping of water over a sink-stone has been registered as the Weatherly Disconnector Waste Water Trap, a section of which is given below. It is manufactured by Messrs. James Stiff & Sons, the well-known sanitary potters, of Lambeth, and costs only a few shillings. The disconnexion is complete, and there is ventilation into the open air. It is scarcely necessary to say that the waste-pipe should be conducted into the inlet pipe at A. The exit-pipe D must be connected with the house-drain. A is 2 in. diameter, B is 3¼ in. diameter, D is 4 in. diameter, all internal dimensions. A B represents a tapering syphon-shaped inlet pipe of such a configuration as to form a deep water seal, and at the same time, to have a free exit at B into the upper, well-ventilated, part of the trap, immediately under the iron grating E E. The increased capacity, and the domed shape, of the pipe at B, are such as to prevent the waste-water being forced up through the grating, even when the pressure is greatest. The exit aperture B is made sufficiently large to admit the hand, thus facilitating the removal of obstructions, if such should occur, and instead of emptying its contents upon the lower pipe, C D, the aperture is turned round so as to discharge the waste-water into the centre of the trap. The exit pipe, C D, which dips 3 in. below the water level, F, forms a second water seal of great strength. Any greasy matter finding its way into the trap will float on the surface of the water at F, so that the pipe entrance C is not liable to be clogged. The exit pipe being of much greater capacity than the inlet pipe, there is no possibility of the trap overflowing. The internal dimensions of the trap are about 9 in. by 10 in. across, by 16 in. deep. There is, therefore, a considerable water surface on which to collect fatty substances, and these may be readily removed through the large iron grating, E E. The Weatherly Trap thus not only breaks the connexion between the waste water-pipes and the house-drains, but also furnishes a good grease-trap.



EMPLOYERS' LIABILITY BILL.

SCHEME FOR INSURANCE AGAINST ACCIDENTS TO EMPLOYÉS.

THE Building Trade may be glad to hear that an influential Committee of London and Provincial Builders has held several meetings; and it is proposed to form a special Company for the Building and Auxiliary trades on purely mutual principles. Details will be issued in a few days.

GAS STOVES.

SIR,—As the late lamentable occurrence at Anerley, and the remarks and comments which have been extensively published in almost all daily and local newspapers upon this sad event, have had the effect of producing great anxiety in the public mind, especially in its bearing upon the matter of gas-stoves, baths, &c., may I be permitted, through the medium of your valuable paper, to offer a few remarks with a view in some measure to relieve the minds of those more particularly interested, and prevent a prejudice arising against an article universally considered so beneficial to health and comfort?

In the first place I would call particular attention to the fact which came out in evidence at the inquest "that the bath-room in question had no ventilation," the window and door both being closed. Now, I take it, if instead of a gas-boiler, a coal or coke fire had been used under the same circumstances, the natural result would have been precisely the same, and the more especially as in the present case, the boiler had been allowed to burn for several hours in a closely shut-up room, sufficient time to heat water enough for five warm baths in succession. This fact has been very recently practically illustrated by the case in which a whole family have been suffocated (or, in other words, poisoned) by merely placing a pan of live coals in a bed-room without any provision for ventilation.

From the reports in several papers, a general impression has prevailed that the cause of death was a gas bath. Such, however, was not the case. It was a separate gas boiler, popularly known as a "water-heater" for supplying hot water to the bath.

With a view, therefore, of preventing the further occurrence of so serious an accident, will you allow me to suggest that in all cases where a gas-boiler or bath is used, the window should be opened at the top and bottom while the apparatus is in operation, and left open for a few minutes after the gas has been turned out? If this is done there is not the slightest fear of any bad results from the use of any such arrangement.

GAS ENGINEER.

BUILDERS' TROUBLES.

SIR,—As a reader of the *Builder* of many years' standing, I feel sure I shall not appeal in vain for an opinion as to whether I have a legal claim for damages under the following circumstances:—

On the 15th day of December I received an invitation from Brown & Jones, architects, asking me to tender for certain works. The usual clause, "The lowest or any tender will not be necessarily accepted," was at the foot. My tender was taken in, and when I was in the architects' office, Jones took the tenders to the proprietor for his decision. He (Jones) returned in about fifteen minutes, and informed me that my tender, being the lowest, was accepted.

Brown, Jones, and myself then arranged for time of completion, examined the plans, and decided upon the portions of work to be commenced with first, and it was agreed I should call in the afternoon and sign the contract. Brown and I then visited the site, and made the preliminaries for commencing the actual work on the following day.

In the afternoon I called as arranged to sign the contract, and was then informed that the proprietor had changed his mind, and that he had decided to give the work to another person. I asked for an explanation from Jones, the architect, but he referred me to the proprietor. Upon seeing him he said he could and would do as he liked. There had been nothing signed, and he preferred the other party.

Is there any custom that would compel the acceptance of the lowest tender when invited in this way?

What would be the grounds of claim, if any?

A. B.

*** We are disposed to think our correspondent would fail to establish a legal claim. It would be held that the architect had simply informed A. B. what he believed was probable.

CHALK-LIME,

ON THE WHARF OR AT THE JOB.

SIR,—May I ask your readers whether, having ordered a certain quantity of chalk-lime, they expect *that quantity* delivered at the works? What was given to my carman as two yards of chalk-lime I found, on reaching Hampstead and having it measured, was barely one yard and a half. Again, two yards ordered of this firm, and delivered at my works, upon being measured were a quarter of a yard short.

Knowing that lime did not usually possess the quality of snow, I sought an explanation of this melting process, when the firm I refer to, whose yard is in Islington, coolly inform me this is the regular thing; and that they have tested it; and from their yard to Thornhill-square, about quarter of a mile, two yards will lose a quarter of a yard in bulk. Now, in the first place, if I accept this statement *cum grano salis*, am I expected to pay for two yards, the amount they say they load, or the yard and three quarters or the yard and a half, as the case may be, that reaches my works?

A. A.

THE LATE FIRE AT MESSRS. J. & J. GREENWOOD'S.

SIR,—So much has been written and spoken of late in reference to the lack of good feeling and sympathy existing between employers and employed, that a noble exception cannot be too widely known.

At the above fire all the joiners' tools were destroyed. As soon as the amount of each man's loss was ascertained, Messrs. J. & J. Greenwood presented to each uninsured workman 7s. 6d. in the pound, to each insured workman 3s. 6d. in the pound, and made good the apprentices' loss in full. We hope publicity will lead other employers to act as nobly when their workmen may be placed in like circumstances.

EMPLOYÉS OF J. & J. GREENWOOD.

Building Abroad.—We learn that a large Building Exhibition will be held at Brunswick during the months of July, August, and September next.

Miscellanea.

New Members of the Royal Institute of British Architects.—At the meeting of this Institute on Monday evening last, the following gentlemen were balloted for and declared to be duly elected,—as Fellows: Messrs. J. W. Connon, Leeds; W. S. Witherington, Mark-lane; and E. Shrewbrooks, Newcastle-on-Tyne. As Associates: Messrs. F. Sills, Department of Public Works, Calcutta; W. J. Gant, Hastings; P. G. Stone, Great Marlborough-street; R. B. Mather, Upton; G. Vigers, Old Jewry; F. T. W. Miller, Wool-exchange; F. J. Oliphant, Chelmsford; W. F. Harriss, Charing-cross; J. H. Smith, Epsom; C. Pertwee, Chelmsford; H. G. Wade, Auckland, New Zealand; C. Young, Bartholomew-road; J. R. Naylor, Derby; A. Pilbeam, Shepherd's-bush; B. W. Cumming, Louth, Lincolnshire; J. Mackland, Argyll-street, Regent-street; A. H. Reid, Grahamstown, Cape Colony; J. Smith, Uxbridge-road; G. Wheelhouse, New Court Chambers, Chancery-lane; G. J. Frisch, Great James-street; W. G. Scott, Eleanor-road, Hackney; C. E. Sayer, Soho-square; C. E. Pertwee, Bedford-place, Russell-square; F. G. Coward, Oxford-street; J. E. Trollope, Streatham; F. G. Green, Maidstone; C. J. Gladman, Bush-lane, Cannon-street; A. E. Billing, Tooley-street, London Bridge; A. J. Bolton, Lincoln's-inn-fields; J. Bilson, Kingston-upon-Hull; and F. H. Roberts, New Broad-street. As Honorary Associates, His Grace the Duke of Devonshire; His Grace the Duke of Abercorn; and Messrs. Thomas Henry Wyatt, Torrington-street, Russell-square; Henry Faija, Great Queen-street, Westminster; and James Jacob Darley, John-street, Bedford-row.

Theatrical.—Miss Rosa Kenney, who made so promising a *début* in Shakspearian parts some short time ago in London, and has since been acting with much and well-deserved success in the provinces, appeared as *Ann Page* in a morning representation of "The Merry Wives of Windsor," at the Adelphi Theatre, on Saturday last. The lady played the part with grace and intelligence, and delivered a transferred speech at the close with much power. At one of Mrs. Freake's afternoon parties (on Monday), Miss Kenney recited with touching effect Lord Byron's lines on the Eve of the Battle of Waterloo, and pleased an audience which included many persons distinguished in literature and art. One would suppose that, in these days of Shakspearian revivals (badly as these are often done), and with the dearth of actresses capable of entering into the spirit of the poet, this young lady's services would be eagerly sought for by London managers. Reverting to the performance of "The Merry Wives of Windsor," Mrs. Arthur Stirling and Miss Williams were excellent as the merry wives, and Mr. Hermann Vezin distinguished himself as he always does, giving the best presentation of *Mr. Ford* that we remember since the days of Charles Kean, with whom the part was an especial favourite.

An Open Competitive Examination for one situation as Assistant to Surveyors in the Office of Her Majesty's Works will be held in London, Edinburgh, and Dublin, under the above regulations, on Tuesday, the 5th April, 1881, and following days. A preliminary examination will be held in London, Edinburgh, and Dublin, on Tuesday, the 22nd March, 1881. Forms of application are obtainable.

Sanitary Institute.—At a meeting of this Institute, to be held at 9, Conduit-street, on Wednesday, March 9th, the discussion will be continued upon the paper read at the last meeting, "The Law in Relation to Sanitary Progress," by Mr. W. H. Michael, Q.C. The points to which attention is directed in the discussion are,—1. Re-arrangement of districts; 2. Reconstitution of authorities; 3. Extension of sanitary powers.

Important Sales of Timber. — Some of our readers may be glad to have their attention called to Messrs. Churchill and Sim's extensive sales of timber by public auction at the Baltic Sale Room on Tuesday, Wednesday, and Thursday next. Particulars will be found advertised on our back page.

Messrs. Shand, Mason, & Co., request us to state that the fire which occurred on their premises in Upper Ground-street, Blackfriars-road, on Wednesday morning, has fortunately left a large portion of the buildings untouched., so that the firm will be enabled to carry on business as usual.

Electric Lighting.—Mr. George Lane Fox's system of electric lighting seems to promise the solution of several difficulties. The lamps can be made of any power and used independently of each other. By the proposed system, large conductors, which may be called electric mains, are to be laid down under the roadway, and proceed from central generating stations in a manner similar to the method now adopted for the distribution of gas. These electric mains are to be insulated by being imbedded in ozokerit or other suitable material, and are to ramify throughout a town or district to every point where a light is required. It is estimated that, on a large scale (comparable to that of large gas-works) energy could be retailed, by means of the electric currents, at a cost of less than a farthing a horse-power per hour; in fact, at a less cost than energy resulting from the combustion of gas, so that electricity could actually be used for heating more economically than gas, and without its accompanying disadvantages.

The Sunday Society and the British Museum.—The letter which was sent to Mr. Gladstone just before his accident, asking him, as First Lord of the Treasury, to receive a deputation from the Sunday Society, with reference to the extra funds required by the Trustees of the British Museum to enable them, in the exercise of their prerogative, to open the British Museum on Sundays, has been printed, and the following is an analysis of the signatures:—

Members of the Legislature	39
Baronets and Knights	25
Mayors of Provincial Towns	67
Fellows of the Royal Society	112
Clergymen	282
Fellows of the Royal College of Physicians	70
Fellows of the Geological Society	284
Members of the Royal Academy of Arts	23
Exhibitors at the Royal Academy in 1880	323
Fellows of the Statistical Society	155
Members of the Royal Institute of British Architects	162
Members of the Library Association of the U. K.	77
Members of other Learned Societies, &c.	526
Total number of signatures	2,145

Collected in one week.

Covering the Royal Exchange.—A petition has been presented to the Gresham Committee from the foreign bankers, merchants, and brokers of the City of London who are in the habit of attending the Royal Exchange for purposes of business, stating that they are desirous of obtaining the advantage of a glass roofing over the now open area. The question of cost, they add, of the proposed covering need not necessarily be an insuperable difficulty. The Gresham Committee have postponed the consideration of the petition, pending the completion of important structural and other repairs rendered necessary by the state of the Exchange. The area ought to have been covered in long ago.

"Institute of Art."—The establishment at Conduit-street taking this title is again open with a collection of works by ladies for sale,—mainly pictures and needlework. Certain prizes are offered each session, and the following is the list of awards just made:—

Oil Painting.—(No Prize). Hon. Mention—Capt. J. Poynter.

Water-Colour Painting.—Prize—Miss E. F. Jackson. Hon. Mention—Miss Beauchamp, Lady Lindsay, Gen. MacBean.

Art Needlework.—Prize—Miss E. Boyd. Hon. Mention—Miss D'Arcy, Mrs. Sandisson.

Painting on Woven Fabrics, &c.—(No Prize). Hon. Mention—Hon. Mrs. Armitage, Miss Shoesmith.

Site for Public Offices.—A Bill has been printed authorising the Secretary of State for India to sell a piece of superfluous land in Charles-street, Westminster, to the Commissioners of Works for the public service. The site contains 27,440 square feet, and is bounded on the east by land already belonging to the Commissioners of Works. The purchase-money agreed upon is 68,600*l*.

Society of Arts.—The next series of Cantor Lectures, to be delivered before the Society of Arts, will be by Professor W. G. Adams, F.R.S., his subject being "The Scientific Principles involved in Electric Lighting." The course commences on Monday, the 7th March. The new incandescent lights of Swan and Lane Fox will be exhibited at the fourth lecture.

Royal Society.—The President and Council have issued cards for receptions on March 9th and April 6th, and for their annual conversazione on Wednesday, May 4th.

The Duke of Westminster has arranged to rebuild Pulford Church, near Chester, at his own expense. When complete the church will cost several thousand pounds.

TENDERS

For manufactory, Nos. 28 and 30, Graham-street, City-road, for Messrs. Carlisle & Clegg. Messrs. Ford & Hesketh, architects:—

Hall, Beddall, & Co.	£9,554	0	0
Lee	8,888	0	0
Roberts	8,168	0	0
Perry & Co.	7,977	0	0
Brass	7,897	0	0
Ashby Bros.	7,752	0	0
Crabb	7,673	0	0
Morter	7,588	0	0
Conder	7,556	0	0
Peto Bros.	7,544	0	0
McLachlan	7,544	0	0
Lawrence	7,370	0	0

For five shops and dwelling-houses to be built in the Peckham-road. Mr. R. J. Worley, architect. Quantities by Mr. R. C. Gleed:—

Downs & Co.	£4,930	0	0
Lawrance	4,850	0	0
Toms	4,839	0	0
Smith	4,790	0	0
Taylor & Parfitt	4,359	0	0
Green	4,285	0	0

For the erection of Board School, Croxdale, near Durham. Mr. Joseph Shields, architect:—

Kell, Chester-le-Street	£2,673	11	4½
Brown, Sunderland	2,422	7	3
Atkinson, Stockton-on-Tees	2,310	7	5
Johnson, Hartlepool	2,280	0	0
Robson & Tremble, Hetton	2,094	4	0
Gradon & Son, Durham	2,062	15	6
Purdie, Gilesgate Moor	2,060	0	0
Lowes, Durham	2,059	0	0
Atkinson & Son, Gateshead-on-Tyne	2,054	11	7
Bailes, Durham	2,053	0	0
Pratt, Durham	1,980	0	0
Whaley, Durham	1,976	0	0
Taylor Bros., Blanchland	1,960	0	0
Robson, Low Fell	1,955	17	4½
Grant, Durham	1,940	0	0
Robinson & Lidster, Ferryhill	1,863	13	0
Elstob, Houghton-le-Spring	1,798	0	0
Ridley, Towlow	1,750	0	0
Foster, Croxdale (accepted)	1,710	0	0
W. & R. Blackett, Bishop Auckland	1,683	12	6
Hurst & White, Langley Moor	1,640	0	0

For new shop, addition, &c., at No. 238, Seven Sisters-road, for Mr. J. Wood. Mr. William Smith, architect:—

Larke & Son	£962	0	0
Shurmur	945	0	0
Harper	932	0	0
Durnford & Langham	879	0	0
Stevens Bros.	828	0	0
Steel Bros.	819	0	0
Dodds & Robb	785	0	0
Mattock Bros.	777	0	0
Wilkinson Bros.	750	0	0

For the erection of shop and cottage at St. Mary Cray, for Mr. G. Ogburn. Mr. G. St. Pierre Harris, architect:—

Eldridge & Gee	£785	0	0
Townsend	775	0	0
Taylor & Sons	698	0	0
Wright	655	0	0
Haisman, Foot's Cray (accepted)	610	0	0

For Saltley (Birmingham) Sewerage Works. Contract No. 3. Mr. E. Pritchard, engineer. Quantities by Mr. E. J. Purnell:—

Fawkes Bros., Southport	£9,771	0	0
Law, Kidderminster	8,777	0	0
Davinson, Sheliton	8,611	0	0
Hughes, Lower Gornal, Dudley	8,500	0	0
Hilton, Birmingham	8,147	0	0
Currall & Lewis, Birmingham	8,075	0	0
Palmer, Birmingham	7,703	0	0
Smith, Westminster (accepted)	7,600	0	0

For alterations to the White Hart, Hoxton, for Mr. E. J. Rose. Messrs. Wilson, Son, & Aldwinckle, architects:—

Cox	£975	0	0
Shurmur	874	0	0
Hearle	833	0	0

For the completion of Nos. 166, 168, and 170, Stoke Newington-road. Messrs. Waymouth & Son, architects. No competition:—

Shurmur (accepted)	£1,300	0	0

For alterations to the Black Friar public-house, Queen Victoria-street. Mr. H. J. Newton, architect:—

General Works.

Burman	£938	0	0
Lidstone	880	0	0
Anley	787	0	0
Shurmur	693	0	0
Walker	690	0	0
Beales (accepted)	671	0	0

Pewterers' Work.

Burrow	£175	10	0
Warne	175	0	0
Heath	159	0	0
Sanders (accepted)	151	0	0

For the erection of two semi-detached villas at Higham Hall Park, Walthamstow. Messrs. Farebrother, Ellis, & Clarke, architects:—

Lipscombe	£2,541	0	0
Drew	2,350	0	0
Mattock Bros.	2,073	0	0
Shurmur	1,962	0	0
White	1,945	0	0
Read	1,881	0	0
Scott	1,840	0	0

For alterations to the Whittington Stone public-house, Highgate-hill. Mr. Wm. Smith, architect:—

Kerry	£598	0	0
Shurmur	593	0	0
Larke	590	0	0
Harper	547	0	0
Durnford & Langham	528	0	0
Stevens Bros.	470	0	0
Steel Bros.	460	0	0
Mattock Bros.	417	0	0

For the erection of a block of three houses, in flats, for workmen's dwellings, at Plaistow, Essex, for Mr. John Low Roots. Mr. Thomas Williamson, architect:—

Alexander	£1,309	0	0
Sharp & Everard	1,300	0	0
North Bros.	1,280	0	0
Button (accepted)	1,260	0	0

For the cemetery at St. Mary Cray. Mr. E. Clarke, architect:—

Wood	£1,499	0	0
Lowe	1,488	0	0
Eldridge & Gee	1,458	0	0
Wright	1,448	0	0
Crockett	1,392	0	0
Haisman	1,350	0	0
Judd	1,337	0	0
J. & H. Cocks	1,298	13	0
Tydman	1,297	0	0
Beale	1,294	10	0
Morris	1,280	6	0
Higgs	1,234	0	0
Evans	1,220	0	0
Wood	1,215	0	0
Angood	1,200	0	0
Groome	1,187	0	0
Cornelius	1,179	0	0
Brett & Son (accepted)	1,103	0	0

For the erection of school, chapel, and presbytery, Lutterworth, Leicestershire. Mr. C. G. Wray, architect. Quantities by Messrs. Linsdell & Giffard:—

Holliday, Grantham	£1,276	0	0
Bromwich, Foster, & Co., Rugby	1,251	0	0
J. & H. Herbert, Leicester	1,202	0	0
Parnell & Son, Rugby	1,195	0	0
Hewitt, Leicester	1,187	0	0
Saw & King, Lutterworth	1,100	0	0
Coleman, Monks Kirby	1,010	0	0
Bass, Leicester	974	18	0
Sawbridge & Turner, Lutterworth	954	18	9

For the construction of a sewer on an Estate at Brockley, near Lewisham. Mr. Henry S. Legg, engineer:—

Carter	£2,500	0	0!
W. & J. Woodham	1,985	0	0
Keeble	1,619	0	0
Bell	1,599	0	0
Kirk & Randall	1,390	0	0
Webb	1,375	0	0
McKenzie & Co.	1,243	0	0!

For the erection of a pair of semi-detached residences in Earlham-grove, Forest-gate, Essex, for Mr. J. Maidment. Messrs. Hills & Fletcher, architects:—

Alexander	£1,175	0	0
Wire Bros.	910	0	0
Crisp & Tomlin	892	0	0
Lee (accepted)	820	0	0

For alterations at No. 42, Stockwell-road, for Mr. W. Yardley. Quantities supplied. Mr. H. J. Newton, architect:—

Pack Bros.	£249	0	0
Mallett	245	0	0
Vears	209	0	0
Burman	207	0	0
Nixon (accepted)	198	0	0

For Army and Navy Hotel, Victoria-street. Contract No. 1, for foundations. Mr. F. T. Pilkington, architect. Messrs. Palmer & Ruault, surveyors:—
Perry & Co., accepted.

For schools at Silver-street, Withall, for the King's Norton School Board. Mr. William Hale, architect. Quantities supplied:—

	Schools.			House.		
Johnson	£2,096	0	0	£612	0	0
Parton	1,778	0	0	436	0	0
Brooks	1,735	0	0	450	0	0
Moffat	1,713	0	0	437	0	0
Corbett	1,697	10	0	437	0	0
Matthews & Son	1,694	0	0	449	0	0
Smith & Son	1,698	0	0	426	0	0
Wilcox	1,700	0	0	415	0	0
Barnsley & Son	1,678	0	0	418	0	0
Bowen	1,639	0	0	414	0	0
Clulee (accepted)	1,590	5	0	400	10	0

For alterations and additions to No. 8, The Paragon, Blackheath. Mr. George Legg, architect. No competition:—
Shurmur, accepted.

For alterations to No. 10, Strand, for Messrs. Davis & Co. Mr. Henry Jacques, architect:—

Clemence	£1,397	0	0
Toms	873	0	0
King & Son	797	0	0
Laing & Son	785	0	0
Panter & Powditch	745	0	0

For stables and workshops, Rugby-yard, Lambs Conduit-street, for Mr. J. W. Elvin. Messrs. Johnstone & Paine, architects:—

Marsland	£2,760	0	0
Mustal	2,537	0	0
Sanders	2,531	0	0
Axford	2,445	0	0
Langmead & Way (accepted)	2,355	0	0

For rebuilding and alterations, No. 6, Lime-street-square, City, for the Investment Company, Limited. Mr. W. Wimble, architect. Quantities supplied:—

Brass	£3,257	0	0
Ramsey	3,219	0	0
Faulkner	3,156	0	0
Ashby & Horner	3,092	0	0
Colls & Sons	3,063	0	0
McLachlan & Sons	3,017	0	0
Morter	2,897	0	0

For villa-residence at Potter's Bar, Herts. Mr. A. B. Gee, architect:—

Eldridge & Gee (accepted)	£325	0	0

For the construction of roads and sewers on the Cricklewood Estate, for H.S.H. the Princess de Lusignan. Mr. Edwin T. Hall, architect:—

Todd, Southgate (accepted)	£560	0	0

For road-making, Bexhill-on-sea, for Lord de la Warr. Messrs. Fowler & Hill, surveyors:—

Cruttenden, St. Leonards	£788	0	0
King, Hollington	550	0	0
Bull	533	0	0

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